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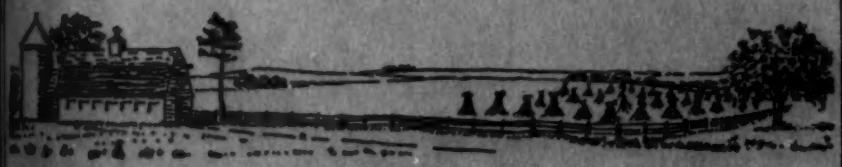
Building Better Soils Builds Better Cattle *American Hereford Journal* 1
Improving the Hogs You Raise *The Dakota Farmer* 7
What Does It Cost To Get a Cow with Calf *Guernsey Breeders Journal* 12
How to Choose a Haying Method! *Farm Science* 17
Living Fences *New England Homestead* 22
New Insecticide for Cotton Growers *Acco Press* 23
Care of Calves Important *The Jersey Bulletin* 26
Farming's History Unfolds Its Story *Eastern States Cooperator* 28
10,000 Sons and Daughters *American Agriculturist* 30
Does Good Farm Forestry Pay? *The Southern Planter* 32
Restoring Grass to Idle Lands *Science for the Farmer* 35
Development of Targhee Sheep *Sheep Breeder* 39
The Way to Get Fast Feathering *Poultry Tribune* 42
Trashy Mulch Methods Recover Tired Land *Capper's Farmer* 43
Indians and Early Agriculture *L. S. Wolfe* 47
Use Litter for 5 Years? *Everybodys Poultry Magazine* 53
New Machines on the Farm Horizon *Kansas Farmer* 56
Does It Pay to Cultivate? *The Michigan Farmer* 62
Transferring Farms Within Families *Land Policy Review* 65
New Grasses for Old *The Farmer* 70
Wood Preservatives *Agricultural Chemicals* 73
Brome Must Have Good Management *Successful Farming* 81
For the Farmer's Library 85
Index 87



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The Farmer's Digest

Volume 11 October, 1947 Number 5

Building Better Soils Builds Better Cattle

Condensed from American Hereford Journal

Dr. William A. Albrecht

Head, Department of Soils, University of Missouri

You too, like many others, may have been asking "Just what do we mean when we say *better* soils; *better* for what?" Grazing on one soil may be better for growing calves while on another soil it may be better for fattening older animals. Pastures are too commonly considered as *good* merely because they are providing considerable tonnage per acre of certain crops. We are coming, however, to see that feed quality depends on the soil fertility, and those cattlemen who are rebuilding and maintaining their soils are also building better cattle.

As agronomists, we have been juggling the various grazable crops into many schemes of crowded successions in their seasonal propriety. Then, too, when the better forage of long-standing reputation for high feed quality, like alfalfa and red clover that are commonly reputed to be "hard to grow," have failed, we have taken to the search for—and the importation of—other crops to replace them. If these immigrant substitutes produce tonnage where their predecessors fail in this measure, we seemingly hail the new-comer as a grand success.

Our eyes have been fixed on the crop, on its tons of forage, and on its bushels of grain. Our eyes and minds have not gone deeper. They have not looked below the crop to recognize the soil and its insufficient delivery of fertility as the possible reasons why bluegrass pasture, for example, does not come on early in the spring; why it fails to carry well into the summer before it becomes weedy, why alfalfa does not yield more heavily and last longer before grasses take it; and why the cattle and other livestock don't do as well as they once did. Our measures of better pasture

Reprinted by permission from the American Hereford Journal

crops have been only quantitative. They must also be qualitative.

In feeding the cattle and other domestic animals, we have thought mainly of the question "How much?" and not often enough of "How well?" We have seen each pasture as a certain crop variety and the bulk it produces. We are just coming around to recognize the fact that it is the soil and its fertility that determines the quality of nutritive value as feed which any crop variety can attain. We are coming to see that it is the *better*—the more fertile—soils that are the *better* grazing in terms of carrying more animals per acre, more animal growth per ton of feed, more animals in terms of better reproduction, and a better business in total.

It has been the discriminating selections by the animals, as we observed them grazing one part of a field given soil treatments in preference to another not so handled, that has slowly brought us to think about using and depending more on the animal's judgment of the quality of the forage. We have been slow to believe that a calf given the chance will make a cow of itself quickly. Yet for hogs we are generally following that very belief as Professor Evoard, of Iowa, the inventor of the self-feeder, gave it to us when he said, "If you will give the pig a chance it will make a hog of itself in less time than you will."

Cow Ahead of Plow in Westward March

We have been too prone to think of the grazing herds as mowing machines when, more significantly, they are physiologists and not economists or farm managers. They are not concerned with tonnage production per acre, nor are they disturbed by a slow rate of their laying on of fat. On the contrary, they are searching for mineral-rich, protein-rich forages that give good body growth, build strong bone, and much muscle, and insure fecund reproduction for maintenance of their species. We have failed to observe their breaking through the fence in the spring, not to go from one cultivated field to another, but instead to go from a cultivated field to the unfarmed highway and to the untilled railroad right-of-way where the virgin soils are growing grass crops that manufacture more than just woody bulk. Our cattle are trying to tell us that, (a) the fertility of our soils is declining, (b) that crops are less proteinacious and less mineral-rich as a consequence, and (c) that the better quality of the feeds must be grown into them from the soil and not thrown in from the chemist's shop. They are

passing judgment primarily on the soil and secondarily on the varieties of the crop.

The declining soil fertility has been responsible for shifts downward of the protein and mineral concentrations within the crops more common formerly. It has been responsible for shifts to newer kinds of crops imported without recognition of the low fertility of the soils growing them indigenously. The declining soil fertility has been pushing the hard wheat, that is, the high-protein wheat, westward. It has brought the soft wheat, that is, the starchy or highly carbonaceous wheat following behind it. It has pushed the cattle and the sheep, that is, the animals of highly lean carcasses, farther west. It has left the hogs, as highly fat carcasses trailing them in this westward march of livestock.

Lower levels of soil fertility in the more acid, and therefore of necessity less fertile, soils of the Eastern United States have pushed the grass-eating, domestic animals westward. It has crowded them more and more into that longitudinal soil belt where that native herbivorous feeder, the buffalo, had selected the soil fertility that grew him well and multiplied him to the large numbers in the thundering herds reported by the forty-niners. He was not a synthesizer of fats. He was a builder of bone and brawn.

Take the soil map, if you will, of the United States and also the map of the population of Herefords to see on what soil areas they are concentrated. You will note that they and the hard wheat are together in our mid-continent. Do we not see that our less-leached, more calcareous soils give high-protein wheat, make mineral-rich and protein-rich grasses, and thereby can *grow* animals—rather than merely put on fat—today as in the virgin past? Can we see a soil fertility pattern outlining the growth-power for cattle and sheep centered in one natural soil area of lesser rainfall and less bulk of crops, while in another soil area of higher rainfall and much tonnage of forage per acre there is located the fattening power? The soil fertility picture on the map and the pattern of livestock distribution of the United States demonstrate the cattle growing themselves on the lime-laden, more fertile soils, or on those not highly leached; while they are fattening themselves on the acid or more severely leached soils. This same relation is verified in Argentine, in the Australia-New Zealand area, and in South Africa. All of these are in the temperate zones with the specific climate soil pattern duplicating that of the United States.

Virgin Soil Fertility Gives Suggestions for Building Soils to Build Cattle

If it was the declining soil fertility, in spite of the calcium now going back in limestone in the Eastern United States as correction for the increasing failures of legume crops, that started the beef cattle marching westward, we might well ask whether that march is still in progress. For a positive answer to this question one needs only recall that the grazing troubles, and breeding difficulties are not new today in what was once the buffalo plains. Soils under low annual rainfalls in the temperate zone have meant grass that grows animals efficiently. But it has also meant small animal tonnage in the crops of grass. Unfortunately we have not taken cognizance of the soil fertility conditions by which the virgin grass makes beef cattle grow well and reproduce well. Such nutritious grass is produced from the fertility released by mineral breakdown and by the decaying organic matter. It was stocked in the soil from the countless crops of virgin grasses that had dropped back to build up that rotating supply of nitrogen and mineral fertility. Rainfall is sufficient to decay the organic matter, but too little rain comes to break down much rock or minerals annually and to bring it out from the unavailable forms. This situation under intensive grazing means rapid depletion of the organic store of fertility. When cattle are harvesting the grass, they carry off its high-protein and high-mineral contents instead of allowing these to drop back to the soil in their cycle of keeping good grass growing by means of the organic matter assembly line of the soil.

Increased grazing pressure on the "short grass" country is depleting rapidly the active fertility in the accumulated organic matter. Short rooted grasses in shallow surface soils soon find too little nitrogen and mineral fertility from which they can manufacture their former high concentration of proteins and mineral complexes within themselves. In their stead there come deeply rooting plants. Those that can penetrate down extensively enough to find minerals sufficient for wood making in a sparse population of trees or bush crops, and being legumes, as many of them like the mesquite are for example, can provide enough nitrogen from the air and the little in the soil to give them their slow growth. Even in the grass country, the good grass, too, is on a westward march seemingly with the mesquite following in its trail.

A Hereford Herd Is Built By a Rebuilder of His Soil

While our cattle population is

seemingly being pushed westward as the declining fertility is crowding out the nutritious grass, and while mesquite and broom sedge are coming in, this is not the universal situation. There are plenty of cattle growers on farms where attention is going to the fertility of the soil. We can think of a Hereford breeder who spent fifty or more years in building a well-known Missouri herd. In his late years, he found his cows becoming shy breeders. Their top lines suggested soreness in the back as it was up and the head down. Their coats were less glossy and, worst of all, fewer callers were coming to purchase his surplus. His experience as a cattle breeder through study of pedigrees and purchases of bulls had built itself up well. But his appreciation of the declining soil fertility of his farm had not grown sufficiently for him to realize that while he was pushing his cattle business upward, the internal strength of his soil—the foundation supporting both him and his herd—was letting him down. It should have been no surprise that buyers of young Herefords were passing him by and going only a few miles farther to another Hereford herd. Perhaps we should say the same herd, since part of his herd was purchased by a novice farmer and hopeful cattle man who as a city business man found himself with some land suddenly on his hands.

This new-comer, who was started in the cattle business by this "old timer's" surplus of one year, had treated the grassland as well as the tilled soil of his farm with limestone and other fertilizers. He brought his soil up to the fertility level that was needed to produce alfalfa. He was subscribing to the belief that mineral-rich, protein-rich forages would grow better cattle. He was convinced that if he built fertility into the soil it would build the cattle for him.

In testimony of the soundness of his judgment, his cows are not shy breeders. His entire calf crop comes during a short season. This simplifies management. His calves are a uniform lot. The animals are active, of good body lines, and easily kept in fine condition. He is filling the market now that this near-by colleague formerly filled. These two are cases where disregard of the soil fertility of his farm put one man out, while restoring and maintaining the soil fertility of his farm put the other man in and gave him the market reputation for that community. Building the soil built the cattle business.

Incoming Weeds Point to Outgoing Fertility

Weeds in our pastures are evidence of the neglect of the soils. They are crops that are manufac-

turing so little of feed value that the cattle disregard them. It is necessary to support the palatable herbage by soil fertility to enable these crops to manufacture what complexes of carbohydrate and protein nature the cattle must have in order to get energy and build their protein-containing tissues. When cattle are confined by fences, we need to appreciate our responsibility of providing all the nutrient essentials in such a limited area which the animals ranging over much more territory are collecting by means of their discriminating choices. If the eye of the master is to fatten the flock, he must see (a) the fertility of the soil, (b) the nutritive quality of the herbage in terms of it, (c) the selective grazing behaviors of the animals as they condemn or approve his judgment and management of the first two of these three essentials in cattle growing. He must see that the animals are selecting according to the nutrient values of the feeds and not according to the particular crop variety or the tonnage per acre.

We are thinking much about soil conservation as it is calling for grass cover to keep the soil from washing away. But when we ask the cows to eat that grass cover, it is far more important to think of the nutritive quality in terms of soil fertility of the soil growing that protection. If the soil is built up in fertility it will grow its own cover quickly. It will granulate itself. This improved soil structure lets water go in rather than off. Soil so improved holds its granular form in spite of the rain. It takes in more water. It extends the grazing season at both ends. It grows a feed of quality that makes healthier and more fecund animals.

If we are going to conserve our soil, the restoration of its fertility is the first step. By this we shall grow grass quickly and abundantly of such feed quality which grows cattle, too. The conservation of the soil will almost be incidental. By starting to think and to work on the fertility, the men who build up their soils through a grass agriculture will be building up good cattle at the same time.

Improving the Hogs You Raise

Condensed from The Dakota Farmer

Leslie E. Johnson

South Dakota State College

THE breeding of better-producing swine is a problem that's going to be increasingly important to swine producers in the years ahead.

Top-notch livestock production demands good breeding stock, proper feeding and management, and correct marketing. While we're talking only about improving the producing ability of the breeding stock, it should be remembered that all of the above principles must be practiced, if the producer is to gain much benefit from improvement made in any one of them. In fact, as far as improvment of breeding stock is concerned, it is probably impossible to make any significant advancement through selection unless proper feeding and management practices are followed.

The necessity for having good feed and care in a breeding program was clearly demonstrated at the South Dakota Agricultural Experiment Station during three of the war years when adequate labor and feed were almost impossible to obtain. During those years, the experimental Poland China herd averaged only 165 pounds at 180 days of age. None of the nine boars, progeny tested during that period, showed any significant superiority over the others in growth rate of pigs.

In 1946, when good feeding and management were again established, the 180-day weight of the experimental herd reached 206 pounds. The 180-day weights of the pigs of the three boars tested averaged 221 pounds, 205 pounds and 179 pounds. Apparently high-producing breeding stock can only exhibit their superiority when feeding and management is sufficient to permit high production. Probably "scrub" animals return more under "scrub" conditions since they have been selected under such treatment.

Select for High Production

The possibilities for improving swine production were shown last year in some swine-improvement work conducted by South Dakota State College Extension Service. Records, involving 229 litters on 24 farms located in 10 counties, showed 8.4 pigs farrowed and 6.5 pigs raised per sow. (Both old sows and gilts were involved.)

Reprinted by permission from The Dakota Farmer, Feb. 15, 1947

At 180 days of age, however, these pigs weighed only 142 pounds. In contrast one line of Poland China experimental gilts at South Dakota State College farrowed 8.5 pigs and weaned 7.5 pigs which weighed 221 pounds at 180 days. These pigs had no special treatment, just good feeding and management. They had, however, been selected for high production. Their ration was corn, protein supplement, and minerals, all self-fed on alfalfa pasture.

How can swine producers improve the inherent pork-producing ability of their hogs? Undoubtedly the most important single breeding procedure for a breeder to practice in this year's pig crop is selection. This job of selection is old, yet new. It is old in that man has known since domestication of animals that he could change his flocks by letting those he liked leave many offspring, while the others left few or none. It is new in that the selection needed in improving our hogs is based more on economic characteristics, such as growth rate, number of pigs farrowed, milking capacity of mother, etc., and less on how the pigs look the day they are selected. This is true regardless of whether the producer is using grade animals, pure-breds, or crossbreds. It may or may not be true when hybrid hogs become available but that will not need to concern producers this year.

What improvement is needed in Dakota hogs so they will produce pork more economically? In the swine experimental work at South Dakota State College, the ideal pig is considered to be the one that makes the most profit for his owner. Since profit depends upon the cost of production and the price of the finished hog, all factors affecting these are considered.

In our work the factors used are: (1) growth rate, (2) productivity of the dam in number of pigs and weight of pigs at weaning time, (3) the individual score of pigs at 225 pounds, and (4) the merit of litter mates in body conformation and growth rate. Growth rate is measured by weight at 154 days. Productivity of dams is measured by number of pigs farrowed and raised and weight of pigs at 56 days. Individual score is the rating given the pig at time of market, based on an estimate of carcass quality and yield. The merit of litter mates is measured as that of the individual pig. Combining all of these factors into one value gives what we call the selection index. The higher the index value the better the pigs are in the above desired factors. Last year the index values ranged from 55 to 167 in our experimental outbred Poland China gilts.

This index is not perfect in that the difference selected for is not all heritable, but it is the best we now have. Records show that producers get approximately one-fifth of that selected for. For instance, the index on the highest Poland China gilt in the herd last year was 167, or 55 points above the average index of 112. We can expect her pigs to possess about one-fifth of the amount selected, or to average 123 points, 11 points above the average if she is mated to a male of similar index. The same is true for her growth rate. She weighed 205 pounds at 154 days, or 44 pounds above average, the average being 161 pounds. If she is mated to a male of similar growth rate we can expect her pigs to average 169.8 pounds or 8.8 pounds above average. It is true that such progress is not phenomenal but it is real and helpful.

The records we keep on each sow and litter are breeding date, farrowing date, birth weight of pigs, 56-day weight, 154-day weight, and body conformation score taken when the pigs weigh approximately 225 pounds. The 56-day and 154-day weights are not taken on these dates exactly, as this would involve too much work and handling of hogs. Knowing the ages of the pigs at date of weighing, however, makes possible a correction for the differences in the ages of pigs, and thus direct comparisons of all pigs can be made regardless of birth date and weighing date.

By keeping and using the following records a lot can be done to improve the productiveness of swine: (1) farrowing date, (2) individual markings of pigs (3) weaning weights of each pig taken at 56 days of age, (4) 154-day weights, and (5) body conformation score. Instead of calculating an index from these facts, the producer can select a minimum standard in size of litter, weaning weight, and score, and then save the heaviest pigs at 154 days of age. For instance, let us assume you have five litters of pigs with the following information

Pig No.	Sex	Weaning Weight	154-day Weight	Score
Litter 1				
1	F	35	160	Good
2	F	40	180	Excellent
3	M	38	175	Excellent
Litter 2				
4	F	20	120	Fair
5	M	22	110	Fair
6	F	21	121	Fair
7	M	27	134	Good
8	F	24	130	Fair
9	F	31	175	Excellent
10	M	20	120	Fair
Litter 3				
11	F	35	160	Good
12	F	34	157	Good
13	M	38	160	Excellent
14	M	35	159	Good
15	M	36	162	Good
16	M	37	170	Excellent
17	M	38	170	Good
18	F	39	175	Excellent
19	M	32	160	Good

Litter 4				
20	F	40	175	Excellent
21	F	42	178	Excellent
Litter 5				
22	F	33	159	Good
23	F	33	161	Good
24	F	32	162	Excellent
25	M	30	148	Good
26	M	31	161	Good
27	M	34	165	Excellent
28	F	32	150	Good

You want to save five of the highest-producing gilts to replace the five old sows. For this group of pigs we should set standards of (1) seven or more pigs raised per gilt, (2) an average of 30 pounds or more at weaning time, and (3) good or higher in score. Then keep no pigs from litters that do not reach these standards. The selection among the remaining gilts should be made on the basis of weight. In other herds the standards set might need to be higher or lower, according to the quality of pigs and the feeding and management practiced.

In the above example, litters 1 and 4 would be eliminated immediately because of the small number of pigs raised per litter. This would be done in spite of the fact that gilt No. 2 was the heaviest pig in the herd at 154 days of age and rated excellent in body conformation. Certainly no one would want to concentrate heredity for small litter size by saving this gilt. However, in an unmarked herd such a gilt is often saved because she is large and attractive to the breeder. Pigs from litter 2 would be eliminated because of the small weaning weight per pig which is indicative of the poor milking ability of the dam.

Pigs in litters 3 and 5 qualify according to the standards set up. The pigs to keep in these litters would be: No. 18—175 pounds; No. 11—160 pounds; No. 12—157 pounds; No. 24—162 pounds, and No. 23—161 pounds. Pig 22 weighing 159 pounds was not selected although No. 12 weighing 157 pounds was saved. The larger number of pigs in litter 3 and the heavier weaning and 154-day weights would make No. 12 slightly more desirable than No. 22 in spite of the slight difference in growth rate in favor of Pig 22.

Making selections without records results in much confusion and guessing. If the largest pigs are selected, one often takes those from small litters such as Pig No. 2 in litter 1. If the medium-to-small pigs are taken, the producer is sure to be getting some slow-growing individuals.

Selecting boars at eight to nine months of age on the basis of body conformation and finish alone often results in selecting slow maturing pigs with little sex interest. Selecting pigs that "rant" a lot may result in getting early-maturing pigs, but pigs that are small and nervous. At the present time, there appears to be

no safe way to select swine breeding stock without records.

Buying by Index

Last fall, South Dakota State College furnished a production index on all boars they sold. The sale catalog contained the 154-day weight, production index of each boar, the boar's pedigree, and number of pigs farrowed. The buyers appeared to appreciate this information. The average price paid for boars with indexes of 150 points or more was $144.38; with indexes of 125 to 149 points, was $97.88, and with indexes below 124, was $83.40.

The use of the selection system suggested could add from one to two pigs per litter in many herds; it could increase weaning weight by five or more pounds per pig; it could increase 154-day weight by 15 to 20 pounds per pig, and it could increase total litter weight by 10 to 25 per cent. Certainly such hogs would be better "mortgage lifters" for producers.

Electric Fence Safety Rules

1. Do not use home-made electric fence controllers.

2. No fence should be energized from any electric source except through an approved controller.

3. Connect an electric fence controller only to the type of power source for which it is designed.

4. A continuous fence should be energized from only one controller.

5. Do not use a controller outdoors which was designed for inside use.

6. See that the controller is installed properly with good ground and lightning protection.

7. Do not tamper with controller; if it needs servicing, return it to the manufacturer to have repairs made by a factory-authorized representative.

8. With battery type controllers the battery should not be recharged while operating the fence.

9. Instruct everyone around the farm how to disconnect the controller in case of an emergency.

10. Do not depend upon an electric fence to restrain bulls, stallions or other vicious animals.

11. Avoid locating an electric fence where the charged wire and a good ground such as pipe line, pump, stock tank, pond, irrigation ditch or other normally wet ground can be contacted at the same time.

12. Identify electric fences, especially those near buildings, property lines or roads with prominent signs.

13. Teach children not to tamper or play with an electric fence.

—Farm Bureau News

What Does It Cost . . . To Get a Cow with Calf?

Condensed from Guernsey Breeders Journal

G. E. Gordon

THE San Pasquale Breeders Association is a unique and highly successful cooperative organization developed for the purpose of artificial insemination and disease control in dairy herds. This cooperative organization is made up of the owners of six dairy herds with about 1,200 milking cows. They are located in the San Pasquale Valley, a short distance from Escondido in the northern part of San Diego County, Calif.

Dairying is one of the major agricultural industries of the area, and all of the members of this association have been highly successful in the operation of their dairy herds over the past several years. The average yearly production of the various herds over the past six years ranged from 366 pounds up to 466 pounds of fat per cow per year, with an overall six-year average of 412 lbs. of fat per cow per year for all herds. This high average production indicates the quality of the cows owned by the members.

The members of this association not only live close together, but have been in the habit of working closely together on other projects. Some years ago, part of this group cooperated in the control of brucellosis. They have practically eliminated calf losses from brucellosis, through the vaccination of all calves with Strain 19. Following their successful experience in this project, they felt they could make further progress by working cooperatively in their breeding operations through the use of artificial insemination and also in the control of mastitis; 60 per cent of all cows culled from the herds of the members during the year 1945 were eliminated because of mastitis infection.

This association was organized in October, 1944, and started operations in January, 1945. The members of the San Pasqual Breeders Association made it evident that they "meant business" through their method of organization and the development of their physical setup. They purchased the ground on which an excellent office and laboratory was built; large, roomy bull pens were constructed of welded pipe

Reprinted by permission from the Guernsey Breeders Journal, Peterborough, N. H., July 1, 1947

with a breeding stall, close to the laboratory. The original cost of the land and equipment totaled $16,700. The items included in this cost were: Land, office and laboratory building, feed room, corrals and sheds, water-well and water system, feed racks and troughs, office equipment, laboratory equipment, veterinary supplies and bulls of the Guernsey, Holstein and Jersey breeds. The association is now using five Guernsey, five Holstein and four Jersey bulls.

The operations are under the supervision of three persons. Mrs. Olive Bradbury has charge of office records. Dr. V. C. Bunker, a veterinarian, and Paul W. Randall, technician, handle the artificial insemination and mastitis-control work in the different herds, and provide Mrs. Bradbury with the data from which she compiles a very complete set of records of all activities of the Association.

A review of the data on results of the fiscal year July 1, 1945, to June 30, 1946, shows that 1,093 cows conceived as a result of artificial insemination. This required 1.97 inseminations per conception on the average. There was a total of 346 collections of semen, with each bull being used only approximately once a week. There was an average of 7.5 inseminations per each collection of semen. Records are maintained on results obtained on each ranch and from each bull. There was a variation among the different bulls of from 1.54 to 2.45 inseminations per conception.

Improvements in methods and techniques are already showing results, as indicated by a summary of the results for the calendar year of 1946, which includes the last six months of the fiscal year reported above. During this calendar year of 1946, there were 1,335 cows inseminated, with 1,112 conceptions, and an average of 1.78 inseminations per conception—compared with 1.97 inseminations per conception during the previous mentioned fiscal year. During 1946, 680 cows conceived on the first insemination.

A breakdown of the costs of artificial insemination for the fiscal year, July 1, 1945 to June 30, 1946, shows that the cost per each collection of semen was $23.47; the cost per each insemination was $3.12, and the cost per conception $7.43. The results during the past several months indicate that these costs may be reduced during this present fiscal year.

Mastitis-control work has also been carried on in the various member herds throughout the past year. The general plan was to start intensive work with one herd, testing all animals frequently until the extent of infection was established, and animals

treated. When the intensive work on one herd was completed, then intensive work on another herd was started, in addition to the routine and control work on the herds already covered. Prior to the work on mastitis control, a survey was made of all member herds. The percentage of infection in the member herds in August, 1945, when this survey was made, ranged from a "low" of 5.1 per cent infection to a "high" of 59.1 per cent, with a total average infection of 34.8 per cent for all herds. One year later, in September, 1946, the percentage of infection ranged from 0.0 per cent up to 5.2 per cent, with an average of 2.5 per cent infection for all herds. This reduced percentage of infection was due to the elimination of some mastitis cows but was mainly due to the treatment of the infected cows with penicillin.

To accompliish these results during the year, 7,116 separate tests for mastitis were made. There was a total of 1,960 vials of penicillin used, with a total cost for the penicillin alone of $1,725.15. Each dairyman paid the cost of penicillin according to his needs in addition to his share of the overhead cost of maintaining the service provided by the Association. During the past few months since September, 1946, there has continued to be some mastitis infection found in the herds, but the number of tests required has been lowered and the amount of penicillin used has been substantially reduced. It is expected that some mastitis infection will probably persist for some time. It is anticipated that the improvement in the mastitis situation will probably not affect the average production of the herds very materially at present because of their already high level of production. It is expected, however, that the mastitis-control work will greatly reduce the amount of culling required and also will reduce the cost of replacements.

With the calf crop materially improved through the control of brucellosis, and with the smaller number of cows culled because of mastitis, it will be possible to cull more closely on production records.

Project Cost $15,836

The cost of the entire project for the fiscal year, July 1, 1945, to June 30, 1946, was $15,836. An analysis of the unit costs of the project is based on the following breakdown: In salaries and mileage, 40 per cent of the cost was allocated to artificial insemination, 40 per cent to mastitis control, and 20 per cent to miscellaneous veterinary service. (This miscellaneous veterinary service includes all service of a veterinary nature on the ranches of the As-

sociation members, including vaccination of all calves for brucellosis with Strain 19.) All of the feed costs and 75 per cent of the depreciation on equipment were allocated to artificial insemination, while with those items of a miscellaneous nature 40 per cent were allocated to artificial insemination, 40 per cent to mastitis, and 20 per cent to miscellaneous veterinary service.

A breakdown on the total costs per cow shows an allocation of $6.77 per cow for artificial insemination, $4.16 per cow for mastitus control, and $2.27 per cow for the miscellaneous service—or a total of $13.20 per cow per year. These costs include all activities concerned with artificial insemination and include all tests and treatments for mastitis—except the cost of the penicillin—and also include all other miscellaneous veterinary service.

The operation of the San Pasqual Breeders Association for approximately two years has been highly successful and the various members have as much or more enthusiasm for its possibilities than they had at the beginning. It is evident that the success of such an organization depends upon efficient personnel and adequate equipment. The cost of the original setup and the cost of operation for the first fiscal year shows that these dairymen have been willing to expend the necessary amount for such adequate facilities.

Contract for $7.00 Per Insemination

Due to the outstanding success of this Association, they have been persuaded to enlarge their activities. A group of dairymen, located near Ramona, only a short distance from San Pasqual, contracted with the San Pasqual Breeders Association to have their cows inseminated at a cost of $7.00 per cow. This work started on November 1, 1946, with approximately 600 cows, but additional cows in the vicinity have since been contracted for, bringing the present total being handled to 800 cows. This inseminatioin work is handled by Dr. Bunker and Mr. Randall, as is done in the regular Association. They have also agreed to run—the milk samples being taken by the owners of the herds but the tests made by the Association personnel.

They have also contracted to provide semen for the San Diego Breeders Association which has just been organized and started operations on March 3, 1947. This San Diego Breeders Association has 1,910 cows in 17 herds. A charge of $2.50 per cow for semen is made for this service to the San Diego Breeders Association, this charge is for semen

from unproved sires, with the understanding that, as sires are proved a charge will be made according to the production level of the daughters of the proved sires. In addition to the breeds above mentioned, two Brown Swiss bulls were added to their bull battery to provide semen for the San Diego Breeders Association. With the providing of semen to this additional Association, semen collections are being made three times weekly instead of twice weekly, as formerly. The San Diego Breeders Association has developed their organization to be handled by a veterinarian and assistant, who will take care of the insemination and other service work connected with their operations.

Due to these added operations, it is expected that during the current fiscal year the cost will be allocated somewhat differently than during the past year. It is anticipated that the details of the breakdown will include: 1, semen production; 2, artificial insemination; 3, mastitis control; 4, miscellaneous veterinary service, and 5, income from outside breeding.

A Unique Association

It is recognized that the San Pasqual Breeders Associatioin is unique in that it is made up of a small group of dairymen having worked closely together over a period of years, and located so close together geographically as to make a working unit practicable. The organization problem is fairly simple, as the various members can meet together and decide on a plan of action which can immediately be put into effect. The importance of excellent personnel in the operation of the project is also obvious in the success of this Association.

All herds are on standard dairy herd improvement test, and are participating in the identification and bull-proving program provided by the Bureau of Dairy Industry and the Agricultural Extension Service, so that all bulls used in their Association will be proved.

The San Pasqual Breeders Association, in spite of its short period of operation, is already being widely used as the model of successful cooperation among breeders and the successful operation of artificial insemination and mastitis-control projects.

How to Choose a Haying Method!

Condensed from Farm Science

R. G. Schmitt and *Earl O. Heady*

How are you going to put up your hay next year? That's a question which farmers face every spring. New labor-saving machines are coming on the market. And many farmers wonder if they shouldn't modernize their old ways of haymaking.

They want to know which of the methods cost the least—and which methods take the least labor. They want to look the new methods over closely before spending money on them.

We've had the usual Iowa haymaking method with us many years. The hay is first cut, then raked in windrows. It is next loaded on a rack by a hayloader, hauled to the barn and unloaded with a barn fork. But in recent years farmers have been turning to new methods. The buckrake, the field chopper and the baler are now being used on many farms. But any one of these methods is not equally satisfactory for all farmers.

To help you decide this question, we made a study of haying methods last year. Our study was made from a survey of farms in Cedar, Linn and Johnson counties on putting up the usual kinds of hay.

Which Method Best?

However, before we discuss the survey, one point should be emphasized: No one method is best on all farms. The best haying method depends on several things:

How many acres of hay you have.

Whether you can get custom haymaking done for you when you want it at reasonable cost.

Whether you will have a chance to do custom work for others profitably if you own a large capacity machine.

How the cost of your labor compares with the cost of machinery.

If you plan to sell part of your hay or feed it all on the farm.

In what form you like to feed your hay.

How much time you have available to spend on haymaking.

Hard Work

The points listed above help you to decide which method is best for your farm. But there is another point you cannot pass

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over. Haying is hard work. However, it is much easier if you use the newer—though perhaps more costly—methods. Many farmers are willing to pay extra money to take the "hard work" out of haying.

One farmer put it this way: "I know I could save better than $80 each year in machinery costs if I put up my hay with a loader and rack. But it is worth more than the $80 to me and the boys not to have to put it up by hand. We get more pleasure out of that $80 spent for the easier haying than if we had spent the $80 for something else." Another man looked at it the other way. He said, "I've got time to get my hay up in the regular way. Why should I put money in high priced machinery when I'd rather use it somewhere else?"

But getting back to the question, "Which method costs the least?" one thing is clear. Each farmer must think through his own situatioin. The tables and charts printed in this article will help you do this.

Labor Needed

The amount of labor needed to put up 1 ton of hay by each of the methods differed greatly. The following figures show how much labor was needed to move the hay from the windrow to the mow in farms we studied:

Loader, 3.2 hours;
Two-man baler, 2.1 hours;
Buckrake, 1.6 hours;
One-man baler, 1.5 hours;
Chopper, 1.2 hours.

You can see that the one-man baler used less than half the labor needed by the loader and hayrack method. But the machinery costs are much higher. Thus, when you compare different methods, you must balance the savings in labor against larger machinery costs.

Machinery costs and investment for the different methods are shown in table 1. The data come from the farms we studied in the survey. We first found the value of the haying machinery on each farm (column 1). Next we found what it would cost to buy this machinery new (column 2). Then we figured the yearly machine cost including depreciation and repair charges (column 3).

Then there are some answers we didn't get. One is the comparative feeding value of hay put up by various methods. Another is the risk of spoilage. But on this we can say that all the methods discussed are being used successfully. It may make a difference what kind of storage space is available—chopped or baled hay have broken down a lot of mow floors. But this need not occur. However, differences in cost seem most important and that's the reason for concentrating on this problem.

Comparing Methods

Now we are ready to start comparing costs for different haying methods. You will see that the one-man baler saves about 1.5 hours of labor per ton as compared with loader and wagon. But buying a baler at the time we made our study in 1946 meant an added machinery investment of about $1,800. If you put up a lot of hay, you can save enough labor to pay for the machine. The more hay you put up, the faster and more easily you can pay for it. So the question of buying a baler depends on how many tons of hay you put up and the cost of extra labor as compared with the cost of machinery.

This is shown more clearly in table 2. It gives the number of years before the value of your labor saved offsets the increased money you have tied up in machinery (when the one-man baler is substituted for the rack and the savings in labor and costs of the baler are as indicated earlier). When you read down column 1 you will see the outcome for different quantities of hay when labor costs you 80 cents per hour. If you put up only 40 tons of hay, you will need about 33 years. But if you put up 240 tons per year, it will take only 6 years.

By reading across the lines in the table you can see that the advantage of the baler over the loader also depends on the cost of labor. Suppose that you put up 160 tons of hay per year. When labor costs 80 cents per hour you need about 8 years before the labor savings here offset the additional machine investment. If your labor is figured at 20 cents per hour it would take 33 years.

You can use the figures in table 2 to find the number of years needed for the savings in labor on your farm to equal the additional machine investment. Differences in power, twine and other costs also have to be added or subtracted to find the net advantage of one method over another. We have used the baler as an example here. You can make similar comparisons between any of the other methods.

Then, too, these figures will be lower in the future if the first cost of machinery falls. Labor and machinery costs will likely be lower in the future. We believe that lower cost balers and choppers will soon be on the market. It is good business to keep your eye on the years ahead when you invest in machinery.

Some farmers have to look at the problem from still a different angle. It might pay a small farmer to buy new machinery. But he might make more cash in the long run to spend his money for something else. This might be livestock, protein feed or fertilizer. A farmer who is short of money with which to operate

How to Tell Which Haying Method is Cheapest for You

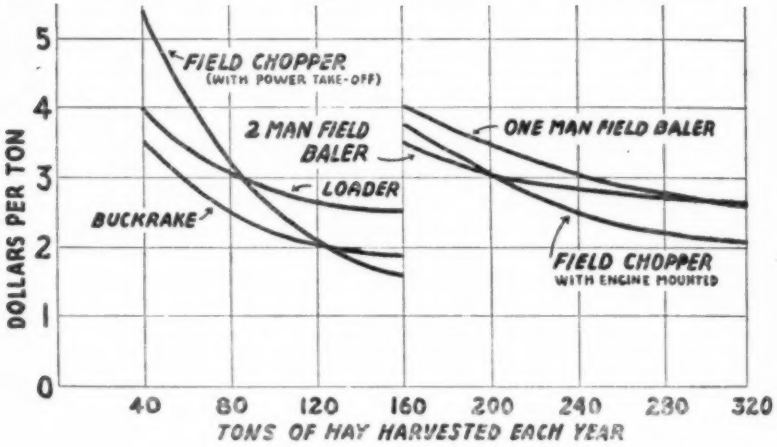

Table 1

TOTAL MACHINERY INVESTMENT FOR DIFFERENT HAY HARVESTING METHODS

Method	Present value*	Present cost if purchased new†	Yearly total machine cost (depreciation and repairs)
Loader	$ 258	$ 543	$ 47
Buckrake	277	646	65
Chopper with auxiliary engine	2,798	3,486	340
Chopper-power take-off	919	1,363	140
Baler—2-man	977	1,464	212
Baler—1-man	1,945	2,365	409

*Value of machines on farms surveyed in 1946.

†Cost of machines if purchased new in 1946.

must pick the most profitable uses to invest his money.

A large operator often has quite a different problem. He is more apt to be pressed for time. This is true not only in putting up hay, but in caring for other crops as well. It might be better, despite higher costs, to finish with the hay quickly. Then he is free to turn his attention to other jobs.

Use the Graph

The graph above combines the labor, machine and power costs for each method. The cost figures are for the entire haying operation. The graph shows that the advantage of one method over another depends upon how many tons you handle. These costs are based on 1946 prices.

For the loader, buckrake and field chopper, the cost lines have not been extended over so many tons of hay. In our study they were used mainly by farmers who put up small amounts of hay. The cost lines for the balers and engine-driven field chopper are shown only for larger tonnages. These high-capacity machines were used for large tonnages of hay. They were not so practical for small farms because of the high first cost of the machines.

You can see by the graph that the buckrake will put up 80 tons of hay at lowest cost. But if you put up 240 tons, the engine-mounted field chopper costs least. The graph also gives a basis for comparing the cost of owning a machine with the cost of custom work in your community. The most common rate for custom baling, where this study was made, was 14 cents per bale. However, rates will be considerably lower in the future. More balers are entering the fields each season. Other costs—labor, fuel, baling wire and machinery—won't stay as high as they are now .

Table 2

YEARS REQUIRED FOR SAVINGS IN LABOR TO EQUAL ADDED MACHINERY INVESTMENT WHEN A 1-MAN BALER IS SUBSTITUTED FOR A LOADER AND A WAGON WITH LABOR AT VARIOUS COSTS*

Number of tons of hay put up per year	Years required with: Labor at 80¢ per hr. (1)	Labor at 60¢ per hr. (2)	Labor at 40¢ per hr. (3)	Labor at 20¢ per hr. (4)
40	33	44	66	132
80	17	22	33	66
120	11	15	22	44
160	8	11	17	33
200	7	9	13	26
240	6	7	11	22

*On the basis of an additional investment of $1800 in haying machinery.

Living Fences

Condensed from New England Homestead

Robert E. Laramy, Jr.

District Conservationist, Soil Conservation Service

LIVING fences of multiflora rose were planted this spring by farmers in most of the New Hampshire Soil Conservation Sub-Districts, as part of their well-rounded conservation programs. Sufficient planting stock to set out about 3,500 feet was obtained by the Sub-District Supervisors from the Soil Conservation Service for the use of cooperating farmers.

These plantings are the first in New Hampshire, and will be watched with great interest. If they develop as well here as in other states, it is anticipated that farmers and woodland owners will make more extensive plantings in the future.

Well developed, properly spaced stands of multiflora rose have turned all kinds of domestic livestock, with the exception of unrung hogs. Fence development takes four or five years under most conditions. The need for low cost barriers to protect woodland and wildlife areas from livestock became apparent early in the history of the Soil Conservation Service. A living hedge or fence seemed to be the answer. *Rosa multiflora,* its scientific name, commonly referred to as multiflora, meaning many flowered, has been planted in various parts of the Northeast during the last eight years, and shows considerable merit for such use.

The plantings in New Hampshire this year were mainly along woodland borders.

New Hampshire forestry authorities rank grazing of woodland as a major conservation problem. Browsing practically eliminates the young hardwoods and contributes to crooked forked stands of conifers. Grazing destroys the understory of young trees which is necessary for abundant wildlife populations. The packed condition of soil resulting from grazing prevents absorption of rainfall, which contributes to erosion and adds to flood danger.

The work of the New Hampshire Extension Service for pasture improvement has been out-standing. Each year more farmers appreciate the dollars and cents benefits of good pas-

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tures. As more farmers develop high quality pastures through planting high producing forage plants, liming, fertilization, mowing, clearing, and controlling grazing, conservationists anticipate there will be less inclination to put stock in the woods. Living fences, inexpensive to establish and maintain, should be added encouragement to divide the pasture from the forest. Experts on maple syrup production have the facts to prove that grazing is also detrimental to the sugar bush.

Several farmers planted multiflora rose this spring to protect streambank plantings. Streambank erosion is aggravated by the sharp hoofs of cattle. Multiflora rose roots help stabilize the banks from washing and blowing and the tops will discourage stock from trampling the banks.

A question often asked is whether multiflora rose will become a nuisance through spreading in the pastures and fields. Reports from farmers who have it on their farms indicate that it does not readily spread. They state that it will not spread in the face of competition from sod, or when the adjacent land is moved, plowed or grazed.

Shrubbery field borders have recently come into high esteem by wildlife managers. There is considerable value to living fences both from the standpoint of game and song birds. In surveys by biologists, multiflora rose was found a superior plant for both food and shelter.

New Insecticide for Cotton Growers

Condensed from Acco Press

Walter B. Moore

Administrative Assistant, Educational Service, NCPA

If a single insecticide would control all, or practically all, of the major insect enemies of cotton, and . . . If that poison were produced from a Southern agricultural raw material, in plants located in the South . . . the Cotton Belt probably could practically eliminate its annual loss from cotton insects, averaging approximately $230,000,000; and, at the same time, add to the income of its landowners and industrial workers.

Toxaphene—also called 3956—may prove to be the insecticide that will do these things.

Toxaphene is a new synthetic

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insecticide produced from wood turpentine obtained from first growth pine stumps. Developed by the Hercules Powder Company, of Wilmington, Del., the material is being produced in test quantities for 1947 and will later be available in commercial quantities from the firm's new plant at Brunswick, Ga.

This material proved very promising in Laboratory, cage and field-plot experiments at the Waco, Texas, laboratory of the Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture, during 1946. It is now being tested in experiment stations of all the major Cotton States. If further research confirms the merits indicated by these early tests, Toxaphene may be as important a development as DDT or other widely-publicized insecticides.

Before discussing the present knowledge of Toxaphene and its significance to cotton, it should be emphasized that: (1) the material will require further research to establish its value and proper use; (2) Toxaphene is not yet available for general use; (3) while it can be produced from wood turpentine derived from pine stumps (first growth) wherever these stumps are available in sufficient quantity, low cost of raw material and production will be a major factor if Toxaphene is to be available at a cost that will permit its wide use by cotton farmers.

The following facts about Toxaphene, or 3956, were presented before the annual meeting of the Association of Southern Agricultural Workers at Biloxi, during January, and are quoted from a paper by E. E. Ivy, C. R. Parencia, Jr., and K. P. Ewing of the Waco Station:

"A new synthetic insecticide, a chlorinated camphene designated 3956, gave excellent control of several of the more important cotton insects in laboratory, cage and field-plot experiments at Waco, Texas, during 1946.

"In cage and laboratory tests a 20 per cent 3956 dust controlled bollworm larvae as well as a 5 per cent DDT dust and controlled boll weevils as well as calcium arsenate or a benzene hexachloride dust containing 5.75 per cent of the gamma isomer.

"A 10 per cent 3956 dust controlled cotton leafworm larvae as well as calcium arsenate, and excellent control of cotton flea hopper adults and nymphs was obtained with concentrations as low as one per cent.

"Twenty per cent 3956 dusts controlled cotton aphids as well as two per cent nicotine dusts, but not as well as benzene hexachloride containing 5.75 per cent of the gamma isomer.

"Twenty per cent 3956 controlled southern green stinkbugs,

cabbage loopers and garden webworms as well as or better than DDT, benzene hexachloride, or calcium arsenate.

"In a small-plot and a large-plot field experiment a 20 per cent 3936 dust gave adequate control of comparatively heavy infestations of bollworms, boll weevil, cotton aphids and leafworms. The 3956 was about equal to calcium arsenate in controlling the boll weevil and was slightly superior to calcium arsenate in controlling the bollworm."

The effective control of a wide variety of insects secured through use of 3956, or Toxaphene, in these tests is especially significant. One of the major handicaps in cotton insect control has always been the necessity for using a variety of poisons and control methods. This has complicated control recommendations, and caused many farmers to do nothing at all, or attempt to control only one type of pest.

As a result, insect pests cost cotton farmers $4,841,000,000 worth of cotton lint and seed from 1923 through 1943, or an average of $230,546,000 yearly. Industry and consumers of cotton and cottonseed products lost large additional amounts of income and needed products. For cottonseed products, alone, the yearly loss amounted to 296,822,000 pounds of oil, 864,000,000 pounds of cottonseed meal and cake, 520,000,000 pounds of cottonseed hulls, and 120,000,000 pounds of linters.

Many observers believe that the elimination of this annual loss depends to a large extent upon finding one control material that will work against all of the major cotton pests. Such a material would permit farmers to follow simple recommendations, and do the entire insect control job with one insecticide, or a simple combination of two or three materials. Then cotton growers, as a whole, might be induced to control insects every year, just as they plow, plant, fertilize or carry on other steps necessary for producing cotton.

Toxaphene may be the answer to this major problem of the cotton industry. It may also provide a use for many of the first growth pine stumps of the Cotton Belt. If these possibilities are realized, it will be worth much to the South and the nation.

Care of Calves Important

Condensed from The Jersey Bulletin

R. L. Stover

Kansas

DAIRY calves that develop into large, strong, healthy cows must be kept growing all of the time. A set-back for even a few weeks or a month or two reduces the final size of the animal. There must be no slackening in the care and attention if the young calf is to do its best.

Neglect of the older calves, while serious, is not as serious as neglect of the young calves. A scouring, poor-doing, small calf will suffer more in final results in a week than an older calf will in two weeks. Probably the principal mistake made in summer care of calves is in allowing them too much grass. At birth, the calf's fourth stomach or paunch, where the roughages are stored, is very undeveloped. The calf is six months old before this paunch has developed very much. When the cows and yearlings are turned onto grass in the spring and they shed off and do well, there is a tremendous urge to turn the small calves out and let them do the same. Rather, I should say, hope that they will do the same. The young calf's paunch holds only a limited quantity of grass. The grass being largely water, the calf does not get much nutrient out of it and it fails to gain weight and do well. Often it scours and actually goes backward. The grass is palatable and the calf fills up on grass, refuses most, if not all, the grain offered and as a result does not get sufficient nutrients.

Small calves up to six months of age should have very little grass. They may be turned out in small pastures or lots and allowed some grass if desired as long as they have available and eat some good quality hay and three to five pounds of grain per day.

If the calf refuses the hay and grain the grazing period should be restricted until the calf will eat the desired roughage and grain. Some systems of feeding calves recommend keeping them in the stalls or barn and feeding nothing but hay and grain until six months old, but I prefer to let the calf out into the lots or small pastures as long as it eats sufficient grain and hay. Older calves, those over six or seven months of age, have a sufficiently developed paunch to handle enough grass so that hay is not

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as necessary for them. They should be fed from three to five pounds of grain per day to keep growing well.

Various grain mixtures are satisfactory but a mixture of oats and shelled corn or of ground oats and corn chop is as good as any. If the animal is not getting legume hay or a small amount of good pasture, the grain mixture should contain some protein concentrate, such as soybean meal or cotton seed meal. About one-seventh to one-tenth of the grain ration should be composed of protein concentrates where grass or legume hay is not fed.

Pasture is usually quite high in protein so carbonaceous hay, such as good timothy, brome grass or prairie hay is satisfactory for calves getting some good grass and, in fact, is to be desired over legume hay for calves for summer feeding.

Dirty calf pens are always bad, but if anything they are worse in summer than in winter. They smell worse and draw flies during warm weather. Pens should be kept clean and well bedded, but luckily the calves are not in them as much as in winter, so they dry quicker and are more easily kept clean in summer than in winter. Flies may bother cows but often they have been a plague for the young calf. If kept around the barn or old pens, the calf is often actually covered with flies. Luckily the day when such conditions can be excused is past. With DDT it is now possible to control the flies on the calves and in the barn. Both the calves, the barn and pens should be sprayed to control flies.

Calves need water and salt just as older cattle. They should have access to water at all times. If watered only once a day they often drink more than is good for them. Provide good water at all times. Salt is usually provided for the older cattle but is sometimes overlooked for the young calf. They relish salt just as do older animals and it should be available at all times.

The calf cannot be neglected if top notch replacements are to be raised. Good calves will grow into strong, healthy cows if the young calves are induced to eat plenty of good hay and three to five pounds of grain are given, with only limited amounts of grass.

Farming's History Unfolds Its Story to a Pacific Campaigner

Condensed from Eastern States Cooperator

Alvan Frank

THOSE of us who made the "Grand Tour of the Pacific," with the Australian rations and malaria thrown in at no extra cost, have seen something of primitive agriculture. In fact, with a little imagination, one can trace the whole advancement of farming. From the swamp people of New Guinea and the Solomons, up through the East Indies, Philippine Islands, Japan and finally the land of the hotdog stand and atom bomb, the United States, the evolution of agriculture unfolds before us.

We'll start long before Joseph's Nile Valley could produce enough grain not only to feed Egypt but also to feed the neighboring countries. We go back further because in Joseph's time they speak of droughts, famine, erosion, abandoned and barren soils. All these, as we all know, are signs of already organized farming activities. So we'll start by visiting the people of South East New Guinea where the most simple farmer on earth lives.

The American farmer fertilizes and plants, cultivates, harvests and feeds. The New Guinea native does one thing—harvests. He is the most primitive farmer—the harvester—or a better word, the hunter. He does not sow, but yet he reaps . . . reaps what Nature grows for him. He has no control over Nature, using and eating what Nature and Nature alone provides. Nothing could be simpler as long as Nature is abundant. This may be the key to our next stage; men will start to control Nature or farm when Nature is not quite so abundant. We ponder this as we travel past Buna Mission, Hollandia and Noemfoer Island, all too familiar names a few years ago, to our next point of observation—the outlying islands of the East Indies.

In these islands we will find people living in small villages and around these villages are farms. Or maybe we should just call them gardens. But, nevertheless, we see people farming, even if it is on a small scale. This long step was comparatively easy as it

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merely meant the transplanting of their favorite wild fruits and vegetables to localities nearer their door, the tropical soil and weather conditions being ideal for this. Yet we see something more; the first sign of domestication of animals. At least, fowl resembling chicks are scratching about. What prompted these people to domesticate the wild jungle bird other than the fact that they wanted a ready source of food? It seems to us, by the manner of both the people and the fowl, that these birds domesticated themselves. The chicken found it easier to live off the refuse piles of the village than to be a party to the survival of the fittest in the jungle. In return for this easy living, the chicken lost its freedom and consequently its eggs and its meat. In fact, an ancient word for chicken, when literally translated into English, means "fowl that lives off rubbish."

Our next point of observation will be far from the little vegetable gardens of the East Indies. It will be to the well organized farms of the Filipino. Here we will see the ancient rice terraces of Baguio sculptured out of the side of a high mountain by the dog-eating aborigines of Luzon. Also, in contrast, the low fertile valleys of rice planted by the later arrivals from Asia, the real Filipino. The farmer, through generations of experience, has learned how to control his food supply to his advantage and to domesticate a slow, stupid animal, the caribou or water buffalo. No longer must he hunt or raise a meager food supply in a small garden. Through trial and error selection he has chosen a number one plant which is very small, but produces generously. With his human nature the farmer has used the least he could to obtain the most he could. This is the rice plant which can still be found in its wild state all over Asia.

In other parts of the world it is wheat and other grains, but the logic remains, the most from the least. With this the farmer has accomplished a wonderful thing, he has freed others to do different things. Let me explain. How could men be physicians, lawyers, truck drivers, engineers, candlestick makers, sailors, scientists or juke box operators if they had to spend all their time in seeking subsistence? The farmer, in advancing to the state where he produces an excess, has allowed his sons to leave the fundamental occupation of providing food to do other things; to construct roads, cities, schools, factories, laboratories, hospitals and all that makes up civilization as we know it.

In the case of the Philippines, as in many other countries, the freeing of mankind to do all these things has left the farmer prac-

tically a slave. What irony! For the men of Manila control the selling and buying of land, the marketing of farm products and the purchasing of farm supplies. For these "freed men" are at the neck of the bottle; they control the outgoing and the incoming of the farm.

We again travel northward to the islands of Japan. Now we have seen how agricultural advancement has allowed for all other advancement. Also, how badly, once this has taken place, the need for agricultural organizations to keep pace with this advancement. Organizations to protect the farmer from what he has started and which now seeks to control him by its very nature.

Japan is similar to the Philippines. The main difference being that the split that agriculture has allowed is now wider. Thus it has intensified farming. Farmers here must slave more to feed the mechanical monster that their production created. Here in Japan, because of the vast population, the intensification of manufacturing, and the small amounts of farming land, it is especially true. Farming is great and hard. The farmers' education consists of knowing how, and in some instances the "whys" and is on the brink of developing to the point where our agriculture was at the turn of the century.

The last lap in our trip eastward across the Pacific, can be spent in reflecting on how American farmers have torn themselves loose from the possibilities of a similar fate, mainly through an inherent ability to realize and do the things necessary to accomplish all this. We have mechanized farming and have used science to work for us. We educate ourselves and our sons and daughters. We control the representatives of our government. Last, we are controlling the results of these labors by our own fair marketing and purchasing so that all this may not be in vain.

10,000 Sons and Daughters

Condensed from American Agriculturist

"They breed like flies" is a term often associated with insects or animals that are pests. However, this expression can now be tied to a similar biological process of an extremely beneficial nature. Artificial breeding is now transposing those "good things that come in small packages" into surprisingly substantial quantities.

Milkdale Aristocrat Rag Apple,

Reprinted by permission from the American Agriculturist, Ithaca, N. Y., July 5, 1947

one of the truly great Holstein bulls in the country, is now credited with a potential of over 10,000 offspring. He was able to accomplish this feat of paternity in the short period of two years, five months. It is doubtful if any other sire of comparable calibre has had the opportunity to achieve so much herd and breed improvement in so short a time.

"Rag Apple" was put into service by the New York Artificial Breeders' Cooperative in December, 1944. He was purchased for this type of work on the basis of his proof as checked against a complete breeding analysis in the herd of George A. Swartout and Son, Clayton, New York. A recent proof released by the Animal Husbandry Extension Department of Cornell University shows that his first 10 daughters that have completed one or more DHIA records produced 15,099 lbs. of milk testing 3.6% for 547 lbs. butterfat on a 305 day, two-time milking, mature equivalent basis. This was an increase of the daughters over their dams of 664 lbs. milk, .1% test and 46 lbs. butterfat. This clearly demonstrates his ability to transmit increased production even when bred to high producing cows.

For all of his seven years, Rag Apple is still performing his functions regularly and with exceedingly good results. Every effort is being made, as is the policy with all animals owned by the N.Y.A.B.C., to insure his usefulness at an efficient breeding level for as long a time as possible. It is hoped that thousands more calves will result from his services to enrich the dairy herds of New York State.

In summary, it may be well to re-emphasize the purpose of an artificial breeding program. If Milkdale Aristocrat Rag Apple had had to spend his entire life in natural service, it is doubtful if he could have sired over 200 calves under ideal conditions. In a little over two years in artificial breeding service he has been able to outdistance this mark by 500 lengths, and the possibilities look very promising for many more rounds. It might be mentioned, in connection with Artificial Breeding, that when great sires are available there is unlimited opportunity for propagating the best.

Does Good Farm Forestry Pay?

Condensed from The Southern Planter

TYPICAL of a million acres of wornout farm land in Piedmont, Virginia, is the Lee Experimental Forest, three miles south of Buckingham Courthouse. Ruined for farming by erosion and one-crop agriculture, timber seems to be the most promising crop, and many farm owners want to know how to grow that crop profitably.

To find answers to that question, 2,700 acres of the land, purchased by the Federal Government under the old resettlement program, have been turned over to the United States Forest Service. On it they plan to answer some of the questions asked by farmers and other owners of similar land. Some of it is well set in young timber. Some has been cut over and burned and some of it is open field which has not reseeded. In short, it is the land we see bordering our principal highways all over the South.

Of particular interest to farmers are two blocks which have been set up specifically to work out problems that are peculiar to farm woods. One block includes 50 acres, and although it contains some pine and a few open fields, is largely the usual mixed oak and hickory forest of the region. The other block contains 42 acres and except for one small open field and a strip of hardwoods along a stream, is nearly all pine.

The difference which sets these Farm Forest areas apart from the rest of the forest is that they will be handled, not as a commercial forest would be handled, but as a farmer might be expected to handle them as a side-line to his main business of farming. So far as possible, the actual work will be done by neighboring farmers and all figures as to cost and returns will be kept on that basis. Instead of cutting an entire block in one operation, as might be done by a mill operator, a few acres will be worked each year by a selective cutting system which will remove not more than the amount of wood which will be replaced by a growth during the same year.

The growth will be figured on the entire block while the cut may be made on only a few acres, but if the cut is held to no more than growth will replace, it is plain that it can be kept up indefinitely. And when we do that, we will have achieved what the forester calls *sustained yield* and what the farmer thinks of as a regular income.

Reprinted by permission from The Southern Planter, Richmond, Virginia, July, 1947

Some of the questions to which answers will be sought are:

1. How can the typical run-down farm woods be put into good growing condition without involving prohibitive costs?

2. What will be the cost in money and labor, and how much will the timber yield after it is in good shape?

3. How can forest crops be harvested so as to yield the highest return and still maintain the forest in good growing condition?

4. Which is more profitable: To sell the trees as they stand or to cut them and sell sawlogs, pulpwood, etc.?

In brief, they want to find out how to manage the kind of forest lands that exist on many farms so as to make them profitable today, and, at the same time, provide for an even greater profit in the years to come.

Unfortunately, this project has not been going long enough in Virginia to give many definite answers. But a similar one in Arkansas has been going for ten years, and some of the figures given in the 9th annual report for that project are of interest as indicating about what we may expect here in the Upper South.

The Arkansas Farm Forestry block contains 40 acres and is within trucking distance of a large sawmill and pulpmill at Crossett, where most of the products are sold. The forest resembles the better of those east of Petersburg, with tall, straight second-growth pines growing on level land.

Work was started in 1937, and a well-stocked stand was chosen in order to determine and demonstrate what returns could be expected, once the farm forest was built up to a good stocking of desirable trees.

The first step was to make an estimate of the timber on the area before cutting started, and to determine how much wood was growing each year. The next step was to cut each year, a volume of wood equal to the amount grown during the year. The trees marked for cutting were the larger trees, those of poor form and any that showed disease. In this way, they made sure that each round of cutting would yield a higher grade timber than preceeding cuts. Suitable parts of all trees cut were made into logs. Other parts yielded pulpwood and fence posts (for treating with preservative), while low grade material and tops were made into fuel wood.

The 1945 cut (the last for which complete returns are available) yielded: 13,144 board feet (Doyle rule) of sawlogs; 42 fenceposts; 15.33 standard cords of pulpwood; and 11.97 cords of fuelwood. The stumpage value of the trees which went to make these products totaled $197, or

when spread over the entire 40 acres, came to $4.92 per acre. When cut into sawlogs, fenceposts, etc., and delivered to the mill, these products sold for $604, or when spread over the 40-acre tract, came to $15.10 per acre. The difference represented a labor income of $407. And these figures are for the 1945 cut only. Eight annual cuts had already been taken, each one yielding approximately the same volume of wood. Yet the amount of wood standing in the forest today is almost identical to the amount with which it started in 1937.

It is worth comment that the more recent cuttings show an increasing amount of sawlogs and fence posts, and a decreasing amount of pulpwood and fuelwood. This, of course is because the cutting resulted in fewer low-grade trees in the forest. In cutting the same volume of wood each year, a larger proportion of good trees are cut. The report further shows that the total volume of salable material removed over the nine years has amounted to 110,536 board feet of sawlogs, 288 fenceposts, 273 standard cords (128 cu. ft.) of pulpwood, and 153 cords of fuelwood. The combined values of all these products, at the time they were cut, amounts to $1,505 for stumpage, or $5,334 when delivered to the market. Spread over the entire 40 acres, this gives an average annual return per acre of $4.18 for stumpage, or $14.81 for the delivered product.

In closing his report, Mr. R. R. Reynolds, of the United States Forest Service says: "The Crosett Forty is convincing evidence that timber, selectively managed, can and should be as much an annual crop as cotton, corn or potatoes. It has an advantage over these crops in that it needs less attention, is much less subject to weather conditions, and can be harvested at the owner's convenience. When prices are poor, it can be safely left standing to grow until the market improves."

The Farm Forestry areas on the Lee forest will, as rapidly as possible, develop and report similar data for Virginia conditions.

Restoring Grass to Idle Lands

Condensed from Science for the Farmer

J. K. Thornton and *H. W. Higbee*

Pennsylvania State College Agricultural Experiment Station

IDLE fields, common in many sections of Pennsylvania, have tended to increase. The original fertility of some of these areas vanished as the top soil was worn thin by erosion or was lost by imprudent agriculture. In some sections industrialization has hastened land abandonment by providing employment in towns. At present nearly all farm houses are occupied although surrounding fields may not be tilled.

The chief cause of land abandonment is a system of agriculture which does not maintain a satisfactory standard of living or permit the use of enough lime and fertilizer to maintain fertility and satisfactory crop yields.

Farmers do not abandon land suddenly because crop growing has become unprofitable. Owners nearly always plan to operate their farms, or have them operated again, but the problem of getting an unused field back into production seems to grow with the passage of time. In general, most severe erosion occurs during the first few years after land goes out of use.

Deep soil may be reclaimed.— Where the remaining soil is shallow and underlain by shale, there is little hope that land once having fallen into disuse ever will be reclaimed for agriculture. On the other hand, preliminary trials indicate that where the soil is deep, although it may be sour, it can be made to produce forage generously, and in some cases other crops. In general, results of experiments have been most promising in the northern glaciated regions.

Impoverished fields cannot be converted into productive grassland except at some expense. This should be emphasized even when opportunities seem most favorable. Initial application of lime and fertilizer may cost more than any reasonable valuation of the land itself. Lime and superphosphate have been found to be the elements most likely to be needed, but light applications of superphosphate often produce no noticeable effect on crop growth.

A farmer who is thinking of reclaiming unused land may obtain helpful advice through his

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county agent. Before starting a project of this kind, the farmer also should study his needs for silage, hay, and pasture. These are the crops usually most readily produced on reclaimed land of this type and they sell readily only when converted into livestock products. If profits are to be made from such a venture, livestock must be available to consume additional forage produced, and the resulting livestock products must be in demand.

Since costs of restoring abandoned land must be considered, a trial acre or two may be valuable in determining whether the process will pay. Once the fertility of a piece of land has been seriously depleted, fertilizer must be applied in fairly large amounts to restore it. Where such applications will only leach away, as on thin shale soils, the only thing to do is to plant the area to trees. Similarly, if a field is very wet, its only economic use is for reforestation or the propagation of wild life.

Grass restored first year.—Results from test areas in various parts of the State indicate that some of these old fields may be converted into desirable grasslands within a year if properly treated. An experiment started on Canfield soil at Frenchtown in Crawford county in 1944 seems representative of what may be expected under similar conditions in that part of the State. This field had been in disuse for many years.

A soil analysis indicated a lime requirement of 4½ tons of ground limestone per acre, and lime applications were made on various plots from none up to 4 tons. Superphosphate applications ranged from none up to 1500 pounds per acre and muriate of potash from none up to 500 pounds per acre. All plots received an application of 187 pounds of sodium nitrate supplying 30 pounds of nitrogen per acre. However, after initial applications, no lime or fertilizer has been applied since the plots were established.

Results from the first two seasons seem to indicate that 4 tons of lime per acre may be necessary to successfully grow alfalfa, a tap rooted plant. For ladino clover, a shallow rooted legume, however, it would be difficult to justify an application of more than 2000 pounds, and this also holds true where orchard grass or brome grass is added to the seeding provided phosphorus is supplied in adequate amounts. Potash did not increase yields on this soil the first year.

First cutting date for all plant material harvested from the plots in June, 1945, a year after these seedings were made, are given in the table. For brevity, yields the second year are not given, but

were comparable. The hay cut during the first year was worth more than the total cost of lime and fertilizer used, making the second year's yields 100 per cent profit in comparison with no treatment.

One notable point made in this data is that where no lime or fertilizer was applied, nothing was grown. Application of 1000 pounds of lime plus 750 pounds of superphosphate per acre produced around a ton and a half of hay per acre from the ladino clover and the mixed grass plots, the item which is perhaps of most interest to the average farmer. Larger than 2000-pound applications of lime accompanied by the applications of superphosphate of 500 pounds or more, resulted in greater yields at correspondingly higher costs.

Trials in other localities.—Somewhat similar experiments were started in Clearfield and Crawford counties in 1944 in an effort to determine the adaptability of grasses and legumes, singly and in combination, to varying soil and climatic conditions. These plots also are located on fields which had been abandoned for a long time. The soil ranged from Volusia to Canfield in type, and drainage was relatively unfavorable for alfalfa but favorable for ladino, alsike clover, and timothy.

Before seeding the plots, ground limestone at the rate of 2 tons per acre and 3-12-6 fertilizer at the rate of 600 pounds per acre were applied. In the spring of 1946 an additional 600 pounds of 0-14-7 was topdressed over the plots. Ladino clover, alfalfa, and birdsfoot trefoil were the legumes used in the seeding mixtures in combination with a wide variety of grasses.

During the seeding year and in 1945 the plots were not harvested early enough and the legumes suffered damage. Yields in general in 1946 in both counties ranged from one to two tons of air-dry hay per acre, and in some instances, more. Timothy and birdsfoot trefoil was the most productive hay mixture, particularly in Crawford county, where the trefoil thickened in stand very attractively. These two plants thrive together since both make a late start in the spring and bloom about the same time.

Other noteworthy observations made on these plots have been: (1) that timothy-legume mixtures will outyield other grass-legume combinations when grown on this soil, (2) that ladino clover thrives on this soil in mixtures with any grass, provided the grass is cut early enough, (3) that orchard grass allowed to get too large tends to smother legumes grown in combination with it, (4) that brome grass, an early

plant, when not supplied with extra nitrogen may be easily crowded out by other grasses and weeds.

In the reclamation of idle fields or abandoned farms, the first consideration must be the depth of the soil. If the soil is deep, even though the top soil largely has disappeared, these trials indicate a favorable possibility that it may be restored to grass production.

Per Acre Summary of First Cutting Data for All Plant Material, Grass-Legume Soil Fertility Experiments, Frenchtown Site, Crawford County, 1945

Treatments*			Air Dry Hay				
Ground Limestone	20% Superphosphate	60% Muriate of Potash	Alfalfa	Alfalfa-Brome Grass	Ladino Clover	Ladino-Orchard Grass	Cost of Lime and Fertilizer
lb.	lb.	lb.	lb.	lb.	lb.	lb.	
000	000	000	300†	nothing	nothing	nothing	$ 000
000	750	250	1090†	1060†	1385†	1680‡	16.85
1000	750	000	1480†	2360	2900	2880	12.95
1000	750	250	1740‡	3010§	2860	3190	19.85
2000	250	000	1400§	2640	1940	2750	10.65
2000	250	83	1326§	1920	2000	3600	12.95
2000	500	83	1940	3100	2160	3170	15.60
2000	750	250	1760	3860	2425	3270	22.85
4000	000	250	1310	1920	1615	2100§	20.90
4000	250	83	1820	5030	2785	4350	18.95
4000	250	250	1880	4770	2540	4710	23.55
4000	500	000	1870	4270	2320	4140	19.30
4000	500	83	2035	4820	1920	4380	21.60
4000	500	160	2520	5260	2440	4660	23.70
4000	500	250	2680	5180	2540	4560	26.20
4000	750	000	2920	5140	2625	4800	21.95
4000	750	83	2700	4560	3020	4630	24.25
4000	750	160	2520	4940	2690	4860	26.35
4000	750	250	2680	5180	2900	4090	28.85
6000	750	250	2560	5730	3120	4800	34.85
8000	750	250	2770	6120	3400	4540	40.85
8000	1500	500	2730	7900	2700	5480	55.70

*All fertilized plots received 187 pounds sodium nitrate fertilizer per acre (30 lb. N).

†All or nearly all weeds.

‡80 or 90 per cent weeds.

§15 or 20 per cent weeds.

Development of Targhee Sheep Through Crossing of Breeds

Condensed from Sheep Breeder

A. Stoehr

United States Department of Agriculture

THE development of the Targhee breed of sheep began in 1926 when select Rambouillet rams were mated with select ewes of Corriedale x Lincoln-Rambouillet and Lincoln x Rambouillet combinations by the Bureau of Animal Industry at the U. S. Sheep Experiment Station, Dubois, Idaho. Descendants of these crosses have been interbred and carefully selected to produce the Targhee breed.

Targhee were developed to provide a stable breed of sheep suited to western ranges with intermediate feed conditions. Much of the western range of this nature is adapted to the use of range ewes of fine-wool foundation but carrying some long-wool breeding. These ewes are often larger than fine-wool ewes and are generally considered more profitable where range conditions are suitable. The Targhee was developed to stabilize this type in a breed of approximately one-fourth long-wool breeding and three-fourths fine-wool breeding. This type is generally recognized as the "comeback" in the West, a name which signifies coming back to the Rambouillet from the first coarse and fine-wool cross.

The Targhee is a polled, white-faced sheep of intermediate size. Mature rams weigh an average of about 200 pounds and mature ewes weigh about 130 pounds in good range condition. This breed has a more desirable mutton conformation than fine-wool sheep, being more blocky, compact, and moderately low set, with good bone and straight legs. The ideal Targhee is free from skin folds and has an open face. Targhees yield heavy fleeces of long staple wool which generally grade ½-Blood and which are moderately light in shrink. Mature Targhee ewes produce an average per year of a little more than 11 pounds of unscored wool with a staple length of about 3 inches and a commercial yield of about 50 per cent of scoured clean wool under the range conditions that are obtained at the U. S. Sheep Experiment Station.

Targhee ewes are good mothers

Reprinted by permission from the Sheep Breeder, Chicago, Illinois, July, 1947

and wean a high proportion of their lambs. The lambs average about 80 pounds in weight at 140 days of age when produced on the range without any grain feeding. The flocking tendency is well developed and the ewes handle uniformly well on the range.

After 3 generations of successful breeding it was thought desirable to increase the numbers and broaden the base of the breed. In the fall of 1937 selected Rambouillet rams were mated to a group of ewes resulting from several generations of top-crossing Corriedale rams on Lincoln-Rambouillet ewes. This mating was repeated for several years. Some registered Corriedale ewes were also included. In the following years additional crosses were made involving Columbia rams x Rambouillet ewes, Targhee rams x Corriedale ewes, and Targhee rams x Corriedale ewes, and Targhee rams x Lincoln-Rambouillet ewes.

The lambs were born during April and May and were herded with their dams on sagebrush-grass or spring-fall range near Dubois, Idaho, until the latter part of June. They were then herded on the high summer range until about the middle of September when they returned to the fall range. Weaning records were taken during the middle or latter part of August at about 120 days of age. The ewe lambs were separated from their dams shortly after the sheep arrived on the fall range. They remained on this range until December when they were trailed to the winter food lot and were fed alfalfa hay. They were returned to the spring range about May 1, and yearling records were taken about June 1.

Records on weaning weight, staple length, type, condition, face covering, and neck folds were studied on 599 Targhee and 415 crossbred ewe lambs born from 1940 to 1945. Data on yearling grease fleece weight, staple length, body weight, type, condition, face covering, and neck folds were also studied on 439 Targhee and 262 crossbred yearling ewes born from 1938 to 1944. Additional data on clean yield, clean fleece weight, and commercial grade of fleece from some of these ewes were examined. Crossbreds were compared with Targhees to determine their stability for foundation Targhee breeding.

Columbia x Rambouillet ewes excelled Targhees in body weight, type, condition, fleece weight, and open face but had shorter staple length and slightly more neck folds. Rambouillet x Corriedale ewes excelled Targhees in staple length, yearling weight, fleece weight, and freedom from folds, but were scored lower in type, condition, and face covering. Both of these crosses produced fleece grades which were fairly

typical of Targhees. These crosses complement each other in that one is strong in the traits in which the other is weak.

Crosses of Targhee rams on Corriedale and Lincoln-Rambouillet ewes produced ewes which were equal to or better than Targhees in most traits. These crosses produced exceptional length of staple but more of their fleeces were classified in coarser grades than were fleeces of Targhees. Selection for ½-Blood fleeces is emphasized in Targhees.

The cross of Targhee rams on Rambouillet ewes was least satisfactory for production of the Targhee type. This cross was inferior to Targhees in every trait at weaning age but at yearling age body weight, type, and condition were better than those of Targhees, although the shorter staple, more covered faces, and greater degree of neck folds persisted. The yearling fleeces graded definitely finer than Targhees.

The results indicate that both Columbia x Rambouillet and Rambouillet x Corriedale crosses produce a fairly satisfactory Targhee type. It would be desirable to use both crosses to produce the Targhee type, because they complement each other. Either interbreeding of the crosses or top-crossing with Targhee rams would be a satisfactory method of incorporating these crosses into the breed. Crosses of Targhee x Corriedale and Targhee x Lincoln-Rambouillet were both satisfactory, although their fleeces were not strictly typical of Targhees. Therefore, with these crosses, further top crosses with Targhee rams would be desirable. With any of the above crosses, several generations of interbreeding or top-crossing with Targhee rams with selection toward the ideal Targhee would be essential before they should be considered as Targhees.

The crossing of Targhees on Rambouillets will require additional generations of use of Targhee rams before the Targhee type is realized. Deficiencies in staple length, face covering, and neck fold, would still be difficult to overcome. If this cross is made one should carefully select for open face, long staple and smooth bodies in the Rambouillet ewes to minimize culling for wool blindness, short staple, and skin folds in the crossbred lambs.

The Way to Get Fast Feathering

Condensed from Poultry Tribune

Dr. F. A. Hays

Massachusetts State College

POULTRYMEN are eager to improve their stock in any possible way. The remarkable progress made in recent years in increasing egg production through the application of genetic principles is fully recognized by all who are interested in American agriculture.

With the shortage of meat in recent years, there is being developed an immense broiler and fryer industry in many localities. To supply this demand, a chick that grows rapidly and that feathers completely at an early age is demanded. There is also less danger from cannibalism in early feathered chicks. It has, therefore, been the task of poultrymen to bring early feathering to the American breeds which are normally slow feathering.

The problem has been studied by a number of investigators whose findings have solved the problem. In order to establish rapid feathering, it is only necessary to apply careful selection to breeding stock with respect to chick feathering.

There is a sex-linked recessive gene which, when present, produces large wing quills at hatching. The effect of this gene is clearly evident at ten days, producing a definite tail growth.

In addition to this sex-linked gene, there is a dominant autosomal gene which completes the back feathering at six to eight weeks in those chicks that carry the sex-linked gene. Either gene alone gives medium feathering, but not complete feathering.

In order to develop a rapid feathering flock, two examinations of future breeding stock are necessary. The first examination may be made at the incubator, but there is considerable variability at this age. There is never any difficulty in spotting the sex-linked gene by tail development at 10 days of age. Those chicks that carry this sex-linked gene should be examined again at about eight weeks and only those with complete back feathering should qualify for breeders.

Reprinted by permission from the Poultry Tribune, Mt. Morris, Illinois

Trashy Mulch Method Recovers Tired Land

Condensed from Capper's Farmer

M. N. Beeler

LIKE the hardpan which an Illinois farmer complained extended up to the second wire of his fence, subsoil is pushing through countless hilltops and slopes in the older agricultural sections. Literally the productive topsoil has washed away, and erosion is eating into the last hope of restoration.

Problem areas thus created are multiplying. They vary from patches to sizeable portions of otherwise well-preserved fields, from whole farms to entire watersheds of some streams. These are the canker acres of the land body. They yield no income.

Until recently the only relief for the owner of a washed-out farm was public acquisition through tax delinquency or outright purchase for reforestation or recreational development. But now there's hope that many of the problem areas or farms can be restored to profitable production. That hope is inspired by a demonstration set up by the U. S. Soil Conservation Service near Zanesville, Ohio. There, on the tired old Muskingum hills, a lush cover of legumes and grasses has been established by a new, simple but certain process, the Trashy Mulch Method. Last fall thickly fleshed cattle grazed the slopes and hilltops. And at the end of October there was a 6- to 8-inch carpet of vegetation for winter protection of the stand and the land.

In contrast Dr. H. L. Borst, project supervisor, points out the site on a neighboring hill where once a big house and imposing barns stood. In their place now is nothing but scant brush, broomsedge and poverty grass—nature's feeble effort to recover the impoverished land. By the time that farm and its improvements had been paid for, the soil was gone.

On a slope in one of the Soil Conservation Experiment Station fields where a hole had been dug, Doctor Borst indicated a scant 5 inches of brownish gray dirt above a coarse, sterile aggregate.

"That," he said, "is not topsoil, nor even subsoil. Both were washed away long ago. What you see is the upper weatherings of basic shale."

Yet above it was a dense stand and vigorous growth of grass and clover 6 to 8 inches high—that on

Reprinted by permission from Capper's Farmer, Topeka, Kansas, May, 1946

land which only a few years ago was considered beyond economic restoration. Prevailing vegetation on surrounding ridges, and up and down the stream courses is broomsedge and poverty grass.

What is left of the soil on those hills is so barren that it will not support useful crops. The slopes are so steep that plowing and tillage to introduce treatments and prepare seedbeds in the ordinary way only resulted in further damage because the loosened dirt and the fertilizer applications washed away before grass could become established. Then Borst conceived the notion of applying treatments, working up a seedbed and sowing seed without covering the vegetation. That procedure succeeded. Trash left on the surface, the dead broomsedge, poverty grass, weeds and sprouts held the surface and the treatments until the new cover took hold and developed.

News that good alfalfa and vigorous grass could be grown on the exhausted crowns and steep sides of those worthless hills soon spread to other sections. First of many groups of farmers who have made pilgrimages to the Soil Conservation Experiment Station to witness that miracle were 25 farmers from Morrow county with their county agent, Elwood Davis.

They took home details of Trashy Mulch Method of rehabilitating worn land. Although Morrow county is outside the Muskingum hills area and the erosion problem is not so great, still there are many areas, a hilltop, a slope, on numerous farms which have been damaged and which Davis said never should have been tilled. Such areas, ranging from an acre to several acres a farm perhaps, had been turned to mediocre pasture, or if they were in an otherwise productive field, simply plowed around and abandoned. The group agreed to try the method in small-scale demonstrations on their individual farms.

They thus provided the first of many farmer field trials which since have been established. Borst is now personally supervising 75 or more in several eastern Ohio counties. Each becomes a demonstration to neighbors in proving that alfalfa can be made to grow on the hills, that profitable cover can be established on exhausted land.

Directions for practicing the Trashy Mulch Method follow. Specifically they apply to the region in Ohio where the method was developed, but the general principles have been proved elsewhere, notably for renovating bluegrass pastures in the steep Mississippi river hills section of Iowa, in the rolling terrain of southern Iowa and in reseeding bromegrass pastures in hilly por-

tions of southwestern Wisconsin.

1—Take soil samples and have lime, phosphorus and potash determinations made. Although blanket recommendations for Muskingum soils have been determined, testing always is advisable. A deficient application will give disappointing results and an excessive one will increase the cost.

2—Apply lime according to the test, which will show a need of 3 to 4 tons an acre for the washed-out fields. Use a little more rather than a little less than the quantity indicated by the test. Make the application ahead of tilling to prepare the seedbed.

3—Disk the limed land in late March or early April or as soon as the soil can be worked. If desired, preliminary disking may be done the fall before. The soil should be moist, not dry, and working a little wet is preferable to delay. Where old cover is thin 2 diskings, lapping half each time, will be enough. If cover is heavy, 3 or more double diskings will be required. Weighting is necessary to make the disk cut through old vegetation, but a deep seedbed is not desired, and the trash should be left on or near the surface. A cloddy rather than a pulverized seedbed is required. If harrowing is considered desirable, use a springtooth which will dig up clods and leave trash on the surface.

4—Fertilize with 350 to 500 pounds, according to test, of 0-14-7 or 0-12-12. Application can be made with a grain drill attachment either before or at the time of seeding.

5—Inoculate thoroughly, with the right cultures, all legume seeds that are to be planted.

6—Mix grasses and clovers according to proved combinations for the locality. Borst and R. E. Yoder, agronomist at Ohio Experiment Station, recommend 10 pounds of alfalfa and 6 pounds timothy an acre. Other combinations are 10 pounds alfalfa with 5 pounds orchard grass, although the orchard ripens at the wrong time for hay; 10 pounds alfalfa with 2 pounds alsike and 6 pounds timothy; or 10 pounds alfalfa with 1 pound ladino clover and 6 pounds alfalfa. Elsewhere a different mixture may be suitable. In Morrow county early seedings included 6 pounds alfalfa, 3 pounds red clover, 1 pound alsike, one half pound ladino, one half pound of Louisiana white (similar to ladino), 5 pounds timothy and 5 pounds brome grass. Brome has not given satisfactory stands at Zanesville.

7—Cultipack on the contour just ahead of seeding to insure a firm seedbed.

8—Sow the mixture broadcast or with an attachment to the grain drill at the rates indicated

in the foregoing paragraph. If seed tubes are arranged so that seed falls behind the fertili.zer tubes the operations of seeding and fertilizing may be combined.

9—Cultipack again on the contour after seeding if time permits.

"This method promotes conditions which are favorable for growth of the grasses and clovers," said Yoder. "At the same time it favors weed germination, and it will give the foulest seeding imaginable." Hence the final step in establishing the cover.

10—Clip the new meadow whenever weeds reach a height of 8 to 10 inches, to prevent them from smothering the alfalfa and grass seedings. A second clipping may be necessary, particularly if any weeds threaten to go to seed, but mowing should not be done later than September 15, because that would prevent development of good cover for winter protection. Occasionally light grazing may be done, but will not obviate the necessity of clipping. Grazing must not be overdone nor continued too late. Sometimes a cutting of hay may be taken if done before mid-September.

Big advantage of the Trashy Mulch Method is the positive results that are obtained when the rules are observed strictly. Cost of establishing a sod is about $18 an acre. "If a low-income farmer has that much money he can work 1 acre," said Yoder. "If he has $36 he can work 2, and so on. And that first year he begins to get his money back, for he can have grazing equivalent to half a ton of hay an acre. The next year with average rainfall he'll get full repayment of his treatment cost."

Yields of hay from Trashy Mulch seeded meadows quoted by Borst and Yoder range from 2.08 to 3.9 tons an acre in favorable seasons, and from 1.75 to 2.25 tons in the dry year of 1941. Usually at least 2 tons, or its equivalent in grazing, can be expected the second year. That, Yoder reminded, is important to the man whose labor income is low.

Indians and Early Agriculture

L. S. Wolfe

EARLY white Americans experienced great difficulty in establishing a successful system of agriculture when they came to this country. Having come from across the Atlantic, mostly from European countries, the few who were farmers knew absolutely nothing about American climate, American soils or even about the crops adapted to their new home.

Failure after failure came to them as they cleared patches in the forests and endeavored to grow crops from the seed they brought with them, with Old World methods and crude Old World farm implements.

Apparently little success came until they began to learn from the American Indian just how he grew the things he cultivated.

Indians were not really farmers. Usually, with certain exceptions in regards to corn, some crops were grown in small clearings around the Indian villages and the work was done largely by the squaws. The braves spent most of their time furnishing the larder with meat in the form of wild game and birds. They also were the warriors, and fought neighboring tribes and sometimes made forays on the poorly manned white settlements. But there were some who did farm and were willing to impart their knowledge to the newcomers. Squanto was the outstanding one of these.

A statue has been made of Squanto and it may be found in Pilgrim Hall at Plymouth, Massachusetts.

Indians certainly were not animal husbandmen and the only domestic animal found among them by the early settlers was the dog. These dogs were used as draft animals, for protection, as companions, hunters and even as food. The horses they used later were obtained from early Spanish settlers, mainly through Mexico and Florida.

Buffaloes, deer, geese, turkeys, pigeons, numerous birds and other wild life were abundant in the forests and plains and furnished the Indians with meat. And there were fish in the streams in many sections of America. There were no chickens. Skins of animals were used for making tents and clothes, bow strings and thongs and the feathers of birds were used as headdresses for the various ceremonials. It is doubtful if any record of research shows that Indians

used eggs or animal milk in their diet before the white man come to these shores. Oysters, clams, tortoise and other equatic creatures were abundant, too, and contributed to the food of the Indians. So—to them there was no real need of raising livestock.

But they did need carbohydrate foods—and Indian corn was the answer.

Indians needed vitamins, and minerals, too—and their natural cravings led them to the forests and banks of streams for the wild fruits and plants. These were abundant and the ingenious Indian had mastered the art of drying and saving some for winter use. These were eaten fresh when in season.

Columbus, Captain John Smith and other pioneers wrote of many native fruits, nuts and vegetation. So Indians didn't have to be horticulturists. Plant diseases were the least of their worries and nature furnished enough for the insects, birds and the Indians.

The Indians also had luxury foods—sweets from the sap of the maple, fresh and dried fruits, nuts and berries and tobacco. Tobacco grew wild in some sections and was cultivated in small patches in others. The leaves were gathered, dried and stored for use. Sir Walter Raleigh learned about tobacco from the Indians and the habit of its use spread to Europe and later over the entire world.

Among the fruits were plums, cherries, persimmons, crab apples, and grapes. The berry list was long and included strawberries, raspberries, both red and black; blackberries, dewberries, cranberries, huckleberries, blueberries, juneberries, gooseberries, elderberries, currants, whortleberries, and mulberries. They had pecans, hickory nuts, black walnuts, butternuts, chestnuts, chinquapins, filberts and in some sections there were edible pine nuts.

Although the Indian did not have to be a horticulturist, they often transplanted some of these bounties of nature to plots favorably located — strawberries especially. Old Roger Williams told of seeing strawberries planted by Indians producing "As many as would fill a good ship within a few miles compass."

Squanto was a remarkable man and made agricultural history. He was friendly and smart, and he was hired by the colonists to teach them the Indian methods of farming—mainly corn growing. He has been called the first county agent and also the first agriculture teacher.

County agents have a national fraternity named "Squanto," which those serving three or more years may join.

When migration to America began European farmers planted most of their crops broadcast. The principal crops they grew

were small grains, mostly wheat, rye and barley, and they tried to plant Indian corn the same way —but with no success.

Indians had been growing corn successfully a long time before the white man came. Indian corn, also called maize, is strictly an American product. Exactly where it came from is not definitely known, but all botanical indications are that it originated in North or South America.

Navajo Indians have the tradition that "All the wise men being one day assembled, a turkey hen came flying from the direction of the morning star and shook from her feathers an ear of blue corn into the midst of the company."

The blue corn of the Navajo Indians is one of the earliest forms of sweet corn cultivated by the settlers and Black Mexican corn of the present day type of sweet corn has been handed down from the earlier days.

Squanto is said to have taught the "Hill" method of planting corn as that was one of the ways the Indians did it. They had other methods, too—the Hopi method and the Omaha or mound method.

Under the Hopi method, which was used by the Hopi and other tribes of the Southwest, a planting stick was used. The stick is about three feet long and has a stilt like projection about ten to twelve inches from the bottom. Much of their land was sandy and dry so in order that the seed might be planted into the moisture the stick was placed into the soil with the foot and holes made in the earth that were eight to twelve inches deep. As many as twenty kernels were dropped into each hole and the hills were almost ten feet apart. A large number of plants came up, but none were thinned out. They were left as protection against the wind and sun.

The Omaha or mound method was used by the Omaha Indians of Nebraska. A rather convenient method was this, because the same mounds were used each year for many seasons. Soil in the cleared land was pulverized and heaped into mounds about eighteen by twenty inches in area and the mounds were about eighteen inches high on the north side and sloped down to the level of the earth on the south. Mounds were built two to three feet apart on all sides and seven kernels were planted to the mound. Ditches were often dug around each mound so that they could be watered in dry seasons.

Squanto probably farmed the "hill" method because that was the one followed by most tribes. Squanto, also called Tisquantum, could speak English, the language of most of the first settlers, and he was first introduced to the

white people by another Indian named Samoset. Squanto was taken to England by Captain George Weymouth in 1605 and came back to America in 1614 with Captain John Smith.

Captain Smith must have thought well of corn as a food crop because every man in his colony was presented with an acre of land and he was instructed to plant corn on it. Back in those days corn was money and taxes, rents and debts could be paid with corn and it was exchanged for marriage licenses.

In the hill method ground was usually selected along the banks of streams and then cleared. Fields were usually irregular in shape and winding because they followed the bends of the streams. When the land was prepared for planting, spots, from two to five feet apart, were pulverized and the hills were ready for planting. No effort was made to get the whole patch in shape, just enough space for each hill where the seed was planted, and the same hills were used year after year.

The hills were cultivated and weeded with crude implements, at first with sharpened hardwood sticks and later implements employed were the shoulder blades of the buffalo and the deer, deer antlers and clam and tortoise shells.

In the Mississippi Valley numerous stone and flint implements have been found which were evidently used as primitive hoes or spades.

Settlers couldn't help much with implements because they didn't bring such things with them. It is recorded that the Plymouth Colony had no plows for twelve years and were dependent on hoes and mattocks for breaking the soil.

When plows began to come in the fellow who owned one had a distinct profession. This plowman was in great demand and he was called upon for his services almost all the year.

Plows of the early period were heavy, ugly and awkward things. They were not constructed on scientific principles, were rough and uneven and hard to pull. Even if the first comers had had plows they could not have used many because they didn't have enough oxen or horses to pull them.

In picking out places to plant corn Indians tried to get land where weeds grew best because they thought, and rightly too, that land was the most fertile. Squanto taught the practice of putting fish in the hill with the seed to make the plant grow better. He, although ignorant of the reasons, recognized the advantage of fertilizers.

Modern seed testing laboratory methods are a far cry from the

primitive ways Indians tested seed for germination. One method was to soak moss from the trees in water and place kernels of corn on the damp moss in a warm place until the seed sprouted. The dead kernels were discarded and the sprouted ones planted. Others made willow baskets, filled them with corn, poured water through the grains and placed the baskets in a warm place to germinate.

Another device similar to the present rag-doll seed germinator was made by Indians using reeds from nettles to make a mat on which the kernels were set. The dampened mats, with corn kernels, were wrapped in buffalo skins or other covering to keep the seed warm until sprouted.

Squanto must have also taught seed selection and may have set up definite standards for seed because many tribes practiced the habit of discarding grain from the butts and tip of the cob and planting only those kernels on the middle portion of the ear. Corn with mouldy cobs or crooked rows were also discarded. Each year, soon after harvest, the seed ears were selected, the husks braided together so that a "Braid" would contain about fifty ears and would be almost five feet long. They didn't know about bushels so they used "Braid" as a measure.

Indians had many varieties of corn and often kept different ones apart in separate patches. They knew corn would mix if planted close together.

Many different varieties of corn were grown by the Indians—there were flint corns, flour corns, pop corns and sweet corns. Even these groups were made up of different varieties as they are today. There were the various colored kinds, and among the primitive corns were the red-streaked flour, pink flour, white flour, red flour, blue flour, spotted flour, yellow flour, salmon colored flour, white flour with black tipped kernels, white flint, yellow flint and pink flint. Small quantities of practically all of these exist even up to the present time.

Squanto is said to have taught the settlers how to prepare corn for food. Flint corn was used mainly in making hominy, a popular dish among the settlers, especially in the Northeastern section of the country. Its use rapidly spread among the white people over the country and it is still a staple breakfast dish in the South.

Flour corn, because of its soft, starchy composition was easily ground in mortars and was valuable for parching and for making soups, puddings and corn bread.

Indians beat us to the use of cereals and fruit for breakfast. They had a way of pulverizing their dried fruits and berries and

mixing them with their pulverized corn and boiling it in water to serve to their families.

Corn was more than just a crop to the Indians, it was really a veneration. Indian medicine men, or high priests, in the middle west, proclaimed the time to plant corn and to harvest the crop. They prayed to the great spirit that the crop might be a productive one. In the southwest the Navajo, the Hopi and the Zuni had corn shrines, corn dances and other corn ceremonies and in South America many of the old Indian temples were decorated with replicas of corn and the corn plant done in silver and gold.

Although corn is the red man's greatest contribution to our agriculture they did contribute other things. While the Indians utilized a large number of native plants only a few were cultivated. Besides corn there were beans, tobacco, gourds, pumpkins, squash and perhaps watermelons. It is not definitely known whether the whites got watermelons from the Indians or vice-versa, but it is known Indians in many sections grew some watermelons, and were very fond of them. It is thought these plants came from the Southwest and were originally from Mexico.

Beans, easy to grow, easy to keep when dry and easy to cook, were useful crops to the Indians. The kidney bean was one that came from the red men, and numerous species of beans are native to different sections of America. Some are climbing while others are of the bush variety.

Gourds were important, too — they were thought to have mystic and medicinal qualities and were used to make rattles for ceremonial dances.

Tomatoes, though of American origin, were not cultivated by North American Indians. It is said the tomato, also known as "Love Apple," was considered poisonous by the majority of American people prior to 1835.

Tomatoes were taken to Europe from South America and used there almost a hundred years before they found use here.

Irish potatoes originated in America, too, and were carried to Europe, where they became popular food and were returned to this country.

Columbus found sweet potatoes and yams on his voyages to America, and there were other crops the new country furnished the world, but they were not generally cultivated by the Indians, nor were they important to his agriculture.

Such were the contributions of the primitive redmen — albeit even today Indians, as a people, have never been considered good farmers.

Use Litter for 5 Years?

Condensed from Everybodys Poultry Magazine

G. T. Klein

Massachusetts State College

If you haven't seen laying house pens with two, three, four or five year old litter on the floor, you may have a surprise in store for you. You'd probably be equally amazed if you saw for the first time two or three broods of chicks that were raised on the same litter.

Wet litter on poultry house floors was so bad in New England a decade ago that houses were like a hog mire most of the winter. Birds waded through this muck getting their feet muddy, and when they went to the nest not only soiled the eggs which they laid, but also soiled other eggs in the nest. The house was so wet that it was an obnoxious place to work.

This condition was rather universal. Some of the insulated houses where birds were started early in the summer got along better. But there was nothing very sure whether a house about coming through the winter in dry condition. There was no positive way to ventilate a building and be certain about the dryness of it.

Then came the litter and labor shortage during the war. Some poultrymen found it impossible to clean their houses because neither litter nor labor was available. they either had to take the chance of housing pullets in an unclean house or not winter them. They took the chance, and to their surprise, losses were no higher than normal. It was amazing to see the dryness of the litter in these pens.

Litter in pens at Massachusetts State College was no different than on poultry farms. We could not keep dry in cold weather, and changing did little or no good. New litter became packed and wet in a week's time. Now if you'll visit the plant, you will find litter that is three years old and is powdery dry even in zero weather. We seldom have a dirty egg. As for mortality, it has been slightly lower than with new litter each fall. If we carry the litter over without getting into trouble, I'm all in favor of it because it has tremendous advantages.

I've tried to state the facts about litter fairly and never to encourage anyone to use it who might get into serious disease

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problems because of carrying it over. It's easy to see that if bacterial diseases are present, one would be running a great risk to carry the litter from one flock to another. We have had no diseases in our flock which have made it hazardous.

The usual precautions are taken in the control of lice, while a yearly painting with carbolineum seems sufficient to control red mites. Scattering flowers of sulphur in the litter will take care of fleas.

Events which led to use of the same litter for two or more broods of chicks were similar. Poultrymen did not have new litter to put in their pens and they did not have labor to change it. Yet when they raised one brood after the other on the same litter, they seemed to get along about as well as on new litter. Of course, they had coccidiosis, but few broods escape it regardless of methods. It did come on early and they seemed to build up immunity against it when the chicks were exposed to it on the old litter. Perhaps the deep layer of litter on the floor has something to do with disease control.

These are trends I've seen developing recently. Maybe like a great many other trends, we will swing back to what was once considered strict sanitation. I'm sure, however, that we can say that the longer we use litter, the better it becomes from the standpoint of dryness.

The January and February hatched pullets which are housed in June or July get a chance to grind up the litter and build it up before cold weather. They can be started on new litter and have dry conditions if the litter isn't changed.

Massachusetts growers have also had good success in taking litter from brooder houses and using it in laying pens. This is built up and stays remarkably dry. We have seen no particular disease hazard from it in most instances.

The poultry department of Cornell University reported on tests with various litters to determine the moisture absorptive power. Here is the relative rating of some of the common litters as they found them.

Litter	Absorptive Ability
Peat moss	4.5
Sugar cane (coarse)	4.4
Straw	4.4
Sugar cane (fine)	4.2
Peat moss and shavings	3.7
Sawdust	3.3
Hay	3.2
Shavings	2.5
Oat hulls	1.4
Sand and gravel	0.14

Here are some litters commonly used in brooder and laying pens with poultrymen's appraisal of them.

Sand—A very satisfactory litter, in spite of rather low absorp-

tive properties, particularly when mixed with another litter such as shavings or sugar cane. It is heavy to shovel in and out of houses, but in spite of this, is very extensively used.

Shavings—Rather low in absorptive power, but a satisfactory litter when gradually built up to a floor covering of considerable depth. It is more satisfactory when mixed with sand. The objection that shavings are injurious to the soil when the floor manure is used as a fertilizer is not well founded. Tests have shown that the usual application rates do not cause an acid condition, as has sometimes been claimed. Dry shavings are much more satisfactory and safe than green shavings.

Peat moss—An excellent litter in most instances, with the reservation that it does get very dusty in some instances. The peat now available is from bogs in the United States and Canada and varies in moisture obsorptive value. Tests to determine the value of a sample are usually the only way of knowing its worth.

Sugar cane—A highly absorptive litter that rates as one of the very best litters. It is extremely satisfactory for laying houses and for brooders.

Straw—Oats, wheat, and rye straw are all highly absorptive litters that are extensively used by poultrymen. They mix well with other litters including sand and are readily available on general farms. Since they must be brought into the New England area by rail or truck the cost is high. Mold must be avoided.

Sawdust—When dry, a very satisfactory brooding litter and fair for the laying house.

Ground corn cobs—Very satisfactory for brooding, but less favored for the laying house. The cobs are ground in a hammermill to pieces about one-quarter inch in size.

Peanut hulls—Very satisfactory for brooding, but seldom used in laying houses. More information is needed on the merits of this litter for the laying pens.

Cottonseed hulls—Rated as a satisfactory brooding litter.

Shredded corn fodder—Dried corn fodder shredded or cut in silage cutter is a satisfactory laying house litter. If finely cut, its rating for the brooder house is also satisfactory.

Cut-up hay—Also a satisfactory litter for laying house or for brooding when clean hay, free of mold, is put through an ensilage cutter.

Use of Hydrated Lime

Hydrated lime is one of the chemicals which has a decided drying effect on litter. It is scattered on the floor litter in the fall or winter at a rate of one pound to about 3½ square feet of floor

area. Another method of expressing it is one pound to each bird. There is some loss of nitrogen due to the action of lime, but it is believed to be rather nominal in fresh manure.

Superphosphate used at a rate of 27 pounds a week to 100 hens is suggested in a Pennsylvania bulletin. It is spread over the droppings boards, pits and floor litter.

New Machines on the Farm Horizon

Condensed from Kansas Farmer

L. E. Childers and *R. B. Gray*
U. S. Department of Agriculture, Beltsville, Md.

MECHANIZATION of farming was the greatest single factor in the agricultural revolution that took place in the United States during the war. With the coming of peace this change continues. Close observers agree that in the next few years further mechanization may have an impact on the farm economy fully as important as during the war years.

On the horizon even now are machine developments that indicate the promise of the coming decade.

The tractor always has led the way in farm mechanization. It is the primary source of power a farmer must have to mechanize his operations.

New tractors now coming on the market are much more efficient than ever. Lighter in weight, they have increased power, and less power generated is needed to move the machine itself. Rubber tires have become almost universal equipment. Most new models of tractors now have a third speed forward for use in moving from one field to another or over highways.

Manufacturers also are giving full attention to safety features. Foolproof shields are provided for power take-offs, other gears and chains to insure safety for the operator. Safety in other machines besides tractors also is getting attention.

Attachments are being simplified. They save the operator time in changing from one machine to another, and also eliminate danger. Hooks or other means are being provided to make it unnecessary for the operator to get off the tractor to lift equipment into place for completing attachment to the tractor. Also, there is some tendency toward design of tractors with adjustable spacing of front wheels as well as of the

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drive wheels. This is particularly true for use in highway work or other high-speed jobs, where distribution of the weight at 4 points rather than 3 is a safety factor.

Hydraulic or mechanical means are now provided on most wheel tractors to give the operator fingertip or touch control of attachments. Power for the hydraulic system is provided by a pump which forces liquid through the system under pressure. To lift plows, cultivators or disks from the ground, or lower them into position, the operator need only move a small lever which opens or closes the necessary valves. This development adds ease and convenience of operation, and is a contribution to safety. One recent development in hydraulic equipment is a remote-control cylinder for operating drawn implements not an integral part of the power unit.

Another feature of present-day power machinery, including tractors, that deserves attention is the precision with which parts are machined and fitted. Antifriction bearings are now used for most working parts. Tolerances are extremely close. A good farm tractor or power machine is as precisely built as an automobile, and deserves equal care and attention. Such precision-built equipment runs smoothly, lasts long and requires few repairs.

But it requires reasonable attention and care, particularly regular lubrication and use of oils supplied by reputable manufacturers. Low-cost oils aren't always a bargain, and with a good piece of equipment it doesn't pay to take chances. Moreover, when major repairs are needed it will pay to have it done in the service department of the dealer who handles the equipment. The majority of these now have factory-trained mechanics, and facilities and repair parts to do the needed work with factory precision and accuracy.

Smaller plow tractors coming on the market will supply a need long evident. They will find a place on small farms everywhere, but particularly in the rolling-hill country. And on many larger farms they will be used for specialized jobs. One of the first of these to be announced is rated at 10 horsepower on the belt, designed to pull a 10- or 12-inch plow. With a speed ranging from 2 to 6 miles an hour, it may be expected to plow 2½ to 3 acres a day with a 12-inch bottom. It also is rated as capable of handling cultivators and similar drawn row-crop tools now commonly used with larger tractors.

In the same size class is a tractor with 2-cylinder engine, 4 speeds forward, and a hydraulic-control system. The drawbar is

said to be unique, being an integral part of the tractor, part of the lift, and part of the working equipment. Tools are designed for attachment by one man from the tractor seat, many with a single attaching pin.

Garden-type tractors of less-than-plow size are now finding a big place in gardening and in farming small tracts ranging from 1 to 10 acres. Expansion in manufacture of this type of tractor has been especially rapid since 1945. Such tractors range from 1½ to 5 horsepower. One garden-size tractor, now on the market, has an automatic-clutch arrangement that adjusts the speed of the tractor to the power requirements, depending on soil and moisture conditions. Attachments for garden tractors range from plow bottoms, cultivators, and planters to mowers and sprayers. This makes them adaptable for a wide variety of jobs for which the larger tractors are used, except on a small scale and at slower speeds.

Proper soil preparation still is the basis of good farming. And the plow has never been replaced as the chief tool used in initial tillage operations, although there are many different designs and shapes. One of the newest now in quantity production, designed as an aid in soil conservation and for deep plowing, is a double-deck type. The upper deck consists of two 10- or 12-inch shares. Below these, giving 2 to 4 inches of additional plow depth, is another similar pair of shares set slightly to the side to give a full 14-inch cut. The lower bases spray a part of the crumbled plow pan into the soil turned over by the upper shares and mix the litter, straw and stalks thoroughly with the soil.

In general, the trend in plow design is now toward higher clearance to prevent clogging by trash, especially at deeper depths. This feature is especially desirable in turning under hybrid corn and other heavy-rooted plants. Straight-shank plows, first introduced 10 years ago and now widely accepted, marked the beginning of this trend. One company also is featuring a plow share on the safety razor blade principle, which when dull is thrown away and replaced with a sharp one.

With much tillage gaining in favor in the drier plains region, more interest also is shown in new subsurface types of tools. These loosen the subsoil to allow moisture to penetrate, but leave straw and other crop residues on or near the surface.

In general, also, with both disk-type and the conventional moldboard plows, the tendency is to build them for mounting on

the tractor as an integral part of the power unit.

Another recent development in tillage machines, involving entirely new principles, may be seen in the once-over rotary types of tools. These combine plowing, disking, and harrowing in a single operation. It is conceivable that, if these machines should be adopted on a large scale, they might materially change farming methods and practices.

There are several different makes in different sizes. In general, they make use of a spiral or auger blade or tines to break up trash and mix it with the soil which is pulverized to a fine seedbed. Further testing and use of these tools under controlled conditions will be necessary to determine effects of such tillage on soil structure and crop yields before their place in farming is fixed. So far such tillage tools have found their greatest usefulness on small tracts and in seedbed preparation and cultivation of vegetables and specialty crops.

With some farm crops, planting to a desired stand is still a major problem in mechanized production. In fact, poor planting has sometimes been a stumbling block to mechanization of other operations, as it is impossible to fill in a poor stand once it is established. Cotton and sugar beets are good examples. In the past it has been common practice to drill the rows and later chop out or thin by hand to the desired stand. Mechanization of both these crops is now getting attention and advances in planting methods are being made.

With beets the planting problem has been partially solved by development of single-germ seed planting. It is estimated that 85 to 90 per cent of the commercial acreage of this crop is now being planted with planters equipped with plates to handle the single-germ or segmented seed. In the case of cotton, hill-drop planters are coming into wider use. With both crops where the seed is drilled in the row some farmers are now using mechanical choppers or blockers to reduce the stand to the desired spacing.

In planting all crops the trend is toward increased speed, and in some cases combining final preparation of seedbed, planting and fertilizer placement in a single operation. A new 2-row corn planter now on the market is equipped with an automatic lift. By the touch of a lever it drops into or out of planting position, with planting starting or stopping automatically. Two- and 4-row drawn planters with rope controls for speed planting up to 6 miles an hour also are available. Grain drills likewise

are being designed for faster seeding. One such drill, field-proved by limited production and use during the last 5 seasons, does an accurate seeding job at speeds as high as 6 miles an hour.

With more farmers using commercial fertilizers on many crops, often in large quantities to obtain high yields, proper placement has become important. Experiments in many states on a wide variety of crops have shown that the right placement of these plant food materials with respect to seed, seedpiece, or transplant, may mean the difference between a record crop or a partial failure. As a result of these experiments, manufacturers now provide fertilizer attachments that will enable producers to place the fertilizer in the best position, which with many crops is at the side of the row. Grain drills likewise are similarly equipped for distributing fertilizers. Latest developments of this kind are attachments for placing fertilizer on the plow sole at plowing time.

In cultivation and weed control equipment the newest developments are machines that use flame or chemicals to kill weeds without disturbing or damaging the crop. On cotton and sugarcane, and in some areas with corn, the flame weeder has been used with considerable success. The machine uses hot blasts of flame from burners similar to a plumber's blow torch to kill weeds while still young and tender as the equipment is drawn along the row. Both bottled gas and distillate are used as fuel. Crops must be large enough to have stems toughened to stand the flame. In cotton the same principle is being used to thin the crop to a stand. The flame chopper uses a wheel arrangement of boxlike shields to protect the plants to be saved, while those in the intervening spaces are killed by the flame.

In chemical control of weeds equipment now used in most cases was designed for other purposes. One such machine being used in the new practice of controlling weeds in small-grain fields with 2-4,D is a long boom-type sprayer with pressure pump. As this method is further developed and more is learned about 2-4,D and its limitations, it seems certain new types of applicators will be developed, either for ground applications or for airplane spraying. As a result of the development of DDT during the war, there also have been many changes made in crop dusters and sprayers. Such equipment for airplane use is now available that makes it possible to get effective control of corn borers and some other insect pests with as little as a gallon of concentrated spray to the acre. High-velocity ground

sprayers and dusters that do an effective job even at high speeds also are available. Another new machine in this same general line still under field test is designed for application of the new soil fumigants for nematode control.

On every livestock or dairy farm one of the heavy burdens has been handling manure so as to conserve its value as fertilizer. Manure spreaders now are much lighter and require less power to pull. They come in many sizes, and some can be quickly converted to serve as tractor trailers. One spreader recently placed on the market delivers the material from the front end. Another is designed to haul liquid manures, thus enabling farmers to have plant nutrients formerly lost. Development of tractor-operated loaders also has helped to simplify the job of keeping the barn clean. Both hydraulic and mechanically operated loaders are available. Some are provided with hay loader and stacker or other lift attachments. One newly developed loader has a hydraulic push-off.

Second Crop in Value

Hay-making methods in many parts of the country now are undergoing a virtual revolution as a result of new machines and equipment. Hay is this country's second most valuable crop. In recent years almost 75 million acres have been devoted to it annually. Hay-making practices range from the most primitive hand methods to complete machine handling. One industry representative has made a list of 41 methods and variations of putting up hay that are in common use in some areas.

Among the newer methods resulting from machine developments is field chopping for silage or dry feed. Some new choppers are multiple-purpose machines. They can be equipped with cutter bar and reel for field chopping of standing green hay or grass for silage. The cutter bar can be replaced with a pickup attachment for chopping partially cured hay from the windrow. Another attachment converts the same machine into a field ensilage cutter for corn, sorghum, or similar standing row crops. The same blower is used to put the chopped material into either silo or barn, as may be necessary.

Farmers have become increasingly aware of the losses of hay that occur each year as a result of weather damage. The field-chopping method has helped to cut down on time in the field. Pickup balers also reduce the time from field to mow. The latest in balers are one-man automatic types. A new type now in quantity production uses wire ties and makes a conventional bale. Some others make rectangular bales with heavy twine ties.

Also in some the hay as baled

is cut into slices convenient for handling. One new baler rolls the hay into a round bale with a twine tie. Some balers are being equipped with improved dust removers. A slide-type loader on one automatic baler makes an easy job of loading the bales. Separate pickup bale loaders also have been developed.

During the war the combine was self-propelled for the first time. The initial machine of this type was manufactured in limited numbers in those years but will now be readily available.

In corn-harvesting equipment several innovations have recently been developed. Just coming on the market in numbers to be readily available, for example, is a new 2-row, lightweight, tractor-mounted corn picker with a straight-through picking unit. It is reported that this picker can be mounted on the tractor by one man in 15 minutes. Another new corn picker is self-propelled. Developed primarily for use where the corn borer is present, but finding a market in other areas also, is a corn-picker shredder. It not only picks the corn but also chops or shreds the stalks so that when turned under the organic matter is quickly assimilated in the soil. Farmers using this machine find the shredded stalks good for livestock bedding.

Does It Pay to Cultivate?

Condensed from The Michigan Farmer

Marshall Sayles

WHY cultivate — especially corn? Most farmers say they do it to conserve moisture and to kill weeds.

Some will tell you they keep the cultivator running during dry spells because it conserves moisture and keeps the corn growing. Experts at college experimental stations around the country, however, can't get any results from tests to support such belief.

Writing in a recent issue of the MSC Quarterly Bulletin, A. G. Weidemann, of the section of soil science, reports on several corn growing tests around United States.

Weidemann says that little gain in yield was made by excessive cultivation in a test conducted in Ohio. The yield was, however, reduced about 75 per cent by not cultivating at all and allowing weeds to grow. At the same station, corn cultivated 4-inches deep

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yielded 45.5 bushels per acre while corn given very shallow cultivation yielded 47.1 bushels.

In Missouri an average yield of 53.5 bushels of corn from deep cultivation was reported. At the same time experts reported 66.9 bushels from shallow cultivation. When they shaved the weeds off at the soil surface with a sharp hoe without forming a mulch, they received 63.8 bushels per acre, Weidemann says.

In a New York test, a yield of 18.1 bushels of corn per acre was reported where weeds were allowed to grow—70.5 bushels where weeds were hand-pulled, and 56.8 where the plots were cultivated and hoed.

Tests at Urbana, Ill., showed little advantage of shallow cultivation over shaving off the weeds. But more advantage of shallow cultivation was shown over deep cultivation. A reduction of 16 per cent in yield from pruning corn roots to a depth of 4 inches with a knife in addition to shaving the weeds, was reported. This might be the same, Weidemann says, as pruning the roots by cultivating too deep.

Results of an Illinois test showed irrigation did not help much where weeds were allowed to grow and no fertilizer used. This shows that use of fertility by weeds as well as soil moisture, is an important factor in reducing corn yields.

Results of investigating the weed factor in cultivation of corn, conducted at 125 experiments in 28 states, are interesting. The average results of all these tests showed that the yield from plots that were not cultivated, but the weeds kept down by shaving, was 99.1 per cent as great as from plots that were cultivated in the usual way. These results also showed that cultivation is somewhat more helpful to corn grown on heavy soils than to that grown in lighter types.

A test was started in 1933 at MSC on Hillsdale sandy loam to test and demonstrate the effect of cultivation on corn yields on that type of soil as compared with shaving the weeds off at the soil surface.

Corn followed clover in a rotation of corn, barley and clover, and the experiment included both fall and spring plowing for corn. Alfalfa was harvested the first year in place of clover as the field was growing alfalfa when the test was started. Corn, which was drilled in rows rather than check-rowed, was fertilized with 200 pounds per acre of 2-12-6 drilled with the seed and seeded to clover.

After the corn was drilled, the areas to be shaved were raked smooth with a leaf rake, without disturbing the seed or fertilizer, to help shave off the weeds later. Weeds were shaved off 3 or 4

times during the summer as required, never allowing them to get much more than an inch high. The cultivated plots were cultivated fairly shallow 3 times during the summer; the weeds in the rows and those appearing after cultivation was discontinued, were removed with a hoe. Corn was planted thick enough to provide a full stand and after the plants came up they were thinned to an average of 15.6 inches apart in the row.

There was not much difference during growing season between corn on cultivated soil and that on shaved soil, Weidemann says. Sometimes it appeared that brace roots came out higher on the stalks on shaved soil than on the cultivated land, and when open-pollinated corn was grown it tended to fall down a little easier on the shaved soil. This could easily be true, since in cultivating soil it is usually piled up to some extent along the rows, he says.

While there were some variations in the annual yields of clover and barley from the differently treated plots, the average yields were surprisingly close, indicating that the natural productivity of the different plots was very similar. And variations in corn yields from the different treated plots should be due to treatment and not to differences in the productivity of the soil.

The test did not show effect of allowing weeds to grow as compared with cultivating or shaving them off with a sharp hoe. But it did show that there is very little advantage in cultivating if the weeds can be removed some other way. There was nothing in the results in favor of either fall or spring plowing.

Now, how can you get rid of weeds without cultivating? Right now, there seems to be no other way, Weidemann says. And he adds that until some selective spray material, or some other selective device is developed that will kill all weeds without injuring corn, we shall probably continue to cultivate. However, there seems to be no particular advantage in cultivating any deeper or any oftener than is necessary to kill weeds. Deep cultivating prunes the roots and may seriously reduce the yield. The plowed soil is more valuable as a feeding area than it is as a mulch to prevent evaporation of water.

It seems advisable, according to Weidemann, to cultivate only often enough and deep enough to control weeds — always being careful not to cultivate deep enough to seriously prune the roots.

Transferring Farms Within Families

Condensed from Land Policy Review

John F. Timmons

FARM transfers within families constitute an important segment of our land-tenure process, even though the American system demands that channels to land ownership must always remain open for young farmers whose parents do not own land. The old saying that the surest way to acquire a farm is to inherit or marry one has a great deal of truth in it. And judging from experiences of other countries and older parts of our own country, we may expect farm transfers within families to become even more numerous as the country becomes older.

Right now, an unusually large number of farm owners and their prospective heirs are searching for the best ways of transferring the home farms. More farmers now own their farms than ever before. Mortgage debt is at the lowest point in 30 years, so more owners have larger equities to transfer. Furthermore, during the war farmers remained on their farms as active operators beyond their normal retirement age. As their sons and daughters return home from the military services and war plants the need for arrangements whereby the younger generation can get started farming as the older generation retires becomes acute.

The process of transferring farms from one generation to the next is fraught with many problems, some of which are serious. All too frequently the death of the owner is followed by the disintegration of the farm as a going unit of production. The farm is sold to settle the estate, or the land is divided among the heirs into uneconomic units, or the heir who buys out the others must mortgage the farm excessively, or life-interests of various kinds arise to plague the continuity and stability of the ownership and operation of the farm.

Breaking up the farm as a going concern at the death of the owner is probably the most serious of these problems. All farm communities bear scars of sales made to settle estates. These dispersement sales destroy the going-concern value of prosperous well-organized farms by scattering to the four winds the machinery, herds, and other

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forms of capital. The new operator must repeat the costly and inefficient process of reassembling the necessary productive factors into a balanced and profitable farm organization.

Another problem is associated with our general expectation—right or wrong—that farms should pay for themselves in each successive generation. For except when a farm is inherited by one heir, farm transfers within families usually necessitate recapitalization of the farm, in whole or in part, each generation. Normally, as several heirs share in a farm, the heir who remains on it goes in debt for that part of the farm that is not included in his own share of the inheritance. In times of inflated land prices, like the present, estate settlements often saddle the heir-operator with a debt that is beyond the long-term earning power of the farm. This is one of the main reasons for farm mortgages, particularly in older parts of the country where transfers within families are more numerous.

The American ideal of owner-operatorship is further affected by the annual transfer of around a billion dollars of farm wealth to urban residents partially offset by transfer of urban wealth to farm people and by the transfer of farms from landlord father to landlord son.

Farm transfers within families should be viewed in the light of the expected objectives. Generally speaking, farm transfers within families should transfer economic farm organizations from one generation to the next with a minimum of problems. During the process the essential unity of the farm as a going concern should not be seriously disturbed. Ownership by the member of the younger generation should be obtained early in life while his enthusiasm is high and his physical vigor is strong. When owner-operatorship must be temporarily delayed and tenancy must be accepted as an intermediate stage, the conditions surrounding the tenancy should be as favorable as practicable to the welfare of the owner, to the security and living conditions of the tenant, and to the productivity of the farm. In the process of transfer, the younger generation of farmers should benefit from the experience and judgment of the old, yet the older generation should be fully protected during their declining years.

Perhaps the most important single objective of farm transfers within the family relates to the security of the parents. This is recognized by State laws of descent as well as in most wills drawn by or for farmers. According to State laws a widow

may not be deprived of her dower interests in her deceased husband's lands. Most farm wills or other farm transfer arrangements provide for parents' income and security during old age—together or as a survivor. Yet, almost every farm community can point to an example of parents who have impoverished themselves to give their children a start in farming. To the degree that their security is achieved much mental as well as physical suffering by the parents may be avoided and they can enjoy the independence they have earned and now deserve.

Equitable treatment of the children is the second major objective in farm transfers within families. But unfortunately the concept of equality, so deeply ingrained in American culture, is frequently substituted for the principle of equitability. As a result, the children or other heirs are not rewarded in proportion to their individual contributions to the welfare of the farm and parents. Moreover, equality of division—not equitability—guides our laws of descent. Even farm owners are reluctant to will or otherwise transfer property to their children on any basis except equal division for fear of creating ill will or jealousy among the heirs.

Many problems associated with transferring farms within families grow out of two basic characteristics of rural families and their farms. Farm families have an average of three or four children while farms average only 195 acres in size. Most farms are too small to be divided among the several children without creating tracts of uneconomic size, or tracts with heavy mortgages, or both.

Problems of transferring the home farm are aggravated by conflicts among the basic purposes. The generally accepted purpose of equality is in conflict with the purpose of equitability based upon what each prospective heir contributes to and receives from the farm. The desirability of transferring the farm to the younger generation early in life of the young people frequently conflicts with the parents' purpose of providing for their own old age. Few farmers can save enough to retire and hand the ownership as well as the operation of their land over to their children. So the son who remains on the farm is never quite sure of his position. His tenure may come to a sudden and disastrous end at the parents' deaths when other heirs push for a settlement of the estate. Lacking surety of expectations, the son has little more incentive to build up the

farm than the usual tenant who has only an annual lease.

Even the most successful father-and-son partnership may end in disaster if no property transfer arrangement is worked out as the foundation for the farm operating agreement. The son or son-in-law who is in the process of taking over the home farm without such a property transfer arrangement is left in a predicament when the parents die and the farm is distributed among all legal heirs according to State laws of descent.

Alternative methods of transferring farms within families include gifts, annuities, wills, laws of descent, purchase contracts, and sales of farms from parents to children. Numerous procedures and variations within these major methods are being used by farm owners. Choice of method is necessarily influenced by the objectives to be achieved and by the conditions surrounding the transfer such as number of heirs, amounts of land and other property, and the economic position of the parents.

If an owner can afford to, he may distribute his lands among his heirs during his lifetime. This practice, sometimes called premature inheritance, gives the heir control over the land at an earlier age than he would have it through a will or a law of descent. Gifts of land are increasing as inheritance and estate taxes grow heavier.

Unfortunately most farm parents cannot afford to transfer lands among their heirs during their lifetimes. Circumstances demand that they retain ownership of their property, to provide them the income they will need during old age. They must search for alternatives that are more in keeping with their circumstances.

An annuity may enable an owner to turn over qualified ownership of land to his children, yet retain annual income rights for himself and his wife. The annuity principle has long been used in insurance to provide a person with a fixed annual income for the rest of his life. To a limited degree annuities have been used in land transfers in the form of "bonds of maintenance" or "Bohemian contracts"—contributions to our land system from Central Europe.

Analogous to annuities for the parents are interest-bearing loans made by the parents to each of the children with provision in the notes that all or a stated amount of the indebtedness is to be cancelled automatically within a period of weeks following the decease of the longer living of the two parents.

The possible use of annuities should be examined by more

farm owners, for they have much to offer in the interests of promoting the security of parents, the welfare of their children, and the continuity of the organization of farms.

Farm owners may will their lands to whom and in such manner as they please with only two important exceptions. The husband cannot defeat the dower rights of his wife. Land owners cannot impose restrictions upon future generations through entail, primogeniture, and other remnants of feudalism.

The use of wills permits parents to retain ownership right up to the moment of their deaths and then to distribute their property as they wish. Scattered studies indicate, however, that the majority of farm owners do not prepare wills. The reasons offered for not using this privilege include inertia, superstitions, and lack of knowledge of the alternative transfer practices in line with the needs of land owners.

In taking advantage of the privilege of transferring land by will, the owner must follow certain procedures prescribed by law. He must be of legal age, and of sound mind. The will must be in writing and be signed by the testator before witnesses. Wills may be changed as often and as much as the maker desires as long as these legal requirements are met. Family changes in the form of marriages, births, and deaths and changes in the family's economic position demand that wills be reviewed every year or so and revised whenever necessary.

In case a farm owner fails to make arrangements for transferring his property, it is distributed by the State laws of descent among his widow and children, or other legal heirs. In theory, these laws take effect simultaneously with the owner's death since land cannot be without an owner under our system of private property. In practice, the probate court ascertains the legal heirs shortly after the owner's death.

Laws of descent differ considerably from State to State, but the widow's welfare is always protected through dower rights—generally a life interest in one-third of the deceased husband's land. Some States also provide for the widower's welfare in the form of courtesy rights. All remaining interests in land are distributed equally among the children. Or, if there are no children, the land goes to other next of kin.

Satisfactory farm transfers within families are not easily achieved. They are subject to the many human emotions and senti-

ments which reach their peak in family relationships. Because of the delicate human relationships involved, it is difficult for families to face with objectivity and foresight the question of transferring their homes and their farms. They are not likely to know about and to weigh carefully the various alternatives open to them. They are prone to delay matters. But today's swift-moving events demand that farm property arrangements—the institutional basis of American agriculture—be kept sound and continuous. This, in turn, requires that farm families give careful study to alternative farm transfer arrangements and the probable results of each upon their individual family conditions. To be effective this study should be followed by prompt and effective plans and action for carrying out these family decisions. This action is demanded by the future welfare of the family, the farm, and the rural community.

New Grasses for Old

Condensed from The Farmer

THERE are in process of development at South Dakota State College some new grass strains which offer great promise of taking much of the gamble out of grass seeding, and which at the same time are more palatable and return heavier yields.

Experimental work done by C. J. Franzke of the college's agronomy staff, begun several years ago indicates that one of the most common causes of failure of new grass seedings is a family of diseases commonly referred to as root rots. All of this family, having much the same effect on grass seedings, may be looked upon as one disease, attacking seedling roots shortly after the plant has pushed its first blades through the surface of the soil, destroying the roots, thus causing the plant to wither and die.

Crested wheatgrass and Brome are quite susceptible to root rot and it is with these two grasses that most of the experimental work is being done. In the greenhouse adjoining the Administration Building on State College campus in Brookings, is flat after flat of Brome and Crested wheatgrass seedings, some in infected soil and some in clean soil. A constant check is being kept on them to discover which strains of

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the grasses are failures when subjected to infected soil, so that they may be culled out.

First selections of Brome for these exeperiments were made following the drouth years of the mid-thirties. Mr. Franzke went through old stands of Brome that had withstood the blazing sun, and the dry, hot winds of '34 and '36 and took seed from more than 200 plants—plants which not only appeared to have come through the drouth in most vigorous condition, but which also had the kind of growth which branded them as superior yielders.

Every tiny lot of this seed was given a number for future identification, and the offspring of each lot was carefully observed from year to year. Some fell prey to root rot, others proved undesirable because of low yield, so that culling for one reason or another has continued until now there are only 44 left. Of these 44, only six are looked upon as outstanding, and perhaps a few years hence the Brome seed that will be showing best results on farms of eastern South Dakota and western Minnesota will come from one of these six strains.

Selection of Crested wheatgrass was made in similar manner, but it was started with more individual plants. There were about 4,000 seedlings in the first tests, and all but 112 of them showed such susceptibility to root rot in the first tests that they were discarded. As tests continued the number dropped to 56, then 15, now there are only five which have proved their ability to take whatever punishment Mr. Franzke dishes out to them.

As an example of what is discovered when the seed from a susceptible strain is tested, Mr. Franzke pointed to data on one of his record sheets. Here was a strain showing an emergence of 88%; but when checked sometime later 48.7% had died leaving a survival of only 39.3%. As proof that the disease organisms in the soil were responsible, seed of this same strain on soil in which the organisms had been killed showed an 88.5% emergence, a loss of only 6% and 82.5% survival.

If the root rots were not so common, Mr. Franzke's self-appointed job of finding resistant grasses would not be so important, but these diseases are common to much of the soil of the Northwest. There often is heard from farmers the complaint that "it looked for awhile like I had a good stand of grass, then something happened to it." That "something" probably was root rot.

Along with this work there is

much other grass experimental work being done at the College. one phase of it is experimenting with a comparatively new grass in the Northwest, Intermediate wheatgrass. This grass was brought into the United States about 1928 and seeded near Colorado Springs. The Soil Conservation Service Division of Nurseries introduced it in South Dakota, and now the South Dakota Experiment Station has 25 acres, the largest plot in America.

As Mr. Franzke discusses grasses he emphasizes over and over again the importance of seeding adapted strains. "Get seed grown reasonably nearby," he advises. For example, Brome seed often is classified as Southern or Northern grown. These designations are not as important as how far north or how far south the seed was produced, and how old was the field from which the seed came.

Nature does her own selecting —a selection following Nature's old rule of permitting only the fittest to survive. In a comparatively new field of Brome there may be many plants that could not withstand a year of severe drouth or other weather extremes while in a field 15 years old or older, natural selection would have eliminated many of these weaklings.

Therefore, until the new, better adapted, hardier, and more disease resistant grasses are available these two rules should be followed in buying grass seed: (1) Buy seed grown reasonably nearby, and (2) Try to get seed taken from fields where stands are five or more years old.

Wood Preservatives

Condensed from Agricultural Chemicals

Milton A. Lesser

DESPITE competition from various quarters, wood continues to be a favorite construction material. On the farm, wood remains the foremost building material. Essential not only for dwellings and other farm buildings, there is also a constant need for wooden fence posts, rural utility poles. To permit the agricultural worker to take advantage of the non-durable but otherwise satisfactory woods commonly plentiful in many localities, simple yet effective methods have been developed for making the available stock resistant to decay and insects.

Under certain conditions, all too common, wood becomes susceptible to the attack of destructive organisms. Wood may decay because of the activity of fungi which infect its fibre and cause it to disintegrate. Conditions of high humidity are especially favorable to the growth of these microorganisms. Such an environment often prevails in stables, pigpens, sheep sheds, dairy barns, storage cellars, and even in dwellings. Moisture is also transmitted to wood by contact with the ground in buildings with wooden foundations, in porches, stock-feeding troughs, stone boats, gates, trellises and arbors, and fence posts. The life of wood is also materially reduced by insects. Termites, powder post beetles, worms, grubs and other insects not only inhabit wood, but often find their nutrition in it.

The life of wood placed under conditions favorable to decay or insect attack can be greatly extended by treatment with suitable preservatives. By such methods the cost per year of service is considerably reduced below that of similar wood without treatment. Aside from the important factor of cutting maintenance costs there are other definite advantages arising from the use of wood preservatives. Since decaying timbers are highly inflammable when dry, preservative treatment reduces fire hazard by keeping the wood sound. Moreover, well-preserved wood maintains a high strength over a longer period of time, while decaying timber rapidly loses its strength. By lengthening the life of wood and permitting the use of lower-grade,

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ordinarily less durable material, preservation treatments not only conserve individual timber supplies but also the nation's timber resources.

Wood preservation by chemical treatment has been employed for more than two centuries. In that time many substances and methods have been developed and much has been learned. Today it is appreciated that the degree of protection given by a good preservative depends largely upon the absorption and penetration obtained. It is also realized that the amount of preservative which must be incorporated in wood to provide adequate protection depends not only upon the species and type of wood being treated, but also upon the intended use of the wood.

Some preservative processes are relatively simple and inexpensive, while others are quite complicated and require rather elaborate, expensive equipment. For satisfactory results with any method of treatment, however, the timber must be sound and suitably prepared for injection or impregnation with the preservative. As pointed out by authorities in the field, it must be remembered that preservatives will not make weak timber strong nor restore the strength of wood that has been partially destroyed by decay.

Methods for treating wood with preservatives are classified broadly as pressure and nonpressure processes. It is generally recognized that the most effective methods of treating wood with preservatives are by pressure processes. Although the several pressure methods may differ in certain details, in general they are all based on the same basic principle. The wood, placed on steel cars, is run into a long cylinder. This is closed and filled with preservative. Pressure is then applied to force the preservative into the wood until the desired amount has been absorbed. The so-called "full-cell" and the "empty-cell" processes are the principal types of pressure treatments commonly used in commercial practices.

Obviously such pressure methods are not available to the farmer or other small land-holder who may wish to process or treat his own timber. For such individuals, nonpressure methods provide comparatively simple yet quite effective means for treating wood to protect it against decay and insects.

Quite a number of nonpressure methods have been developed. Preservatives may be applied by brushing or spraying, charring and spraying, dipping, steeping, diffusion in the sap stream, and the hot-and-cold bath or open

tank treatment. Steeping wood for a week or more in a preservative solution, the application of sap stream diffusion methods, and the hot-and-cold-bath treatments are capable of giving satisfactory protection when properly applied. All of these treatments may be applied on a small scale without the use of the expensive equipment required in the pressure processes. In addition, a number of other fairly simple, more or less efficient methods have been described in technical and patent literature. The most effective of these non-pressure processes is the open tank, or hot-and-cold-bath, which is often used on a commercial scale, principally with creosote as the impregnating agent.

During recent years, interest has been focused on the preservative processes variously known as sapstream methods, modified Boucherie or sap displacement methods, or tree injection methods. Chemical impregnations of trees and poles by such methods have been tried out in one form or another for centuries, but were not widely used because they did not appear to be commercially feasible. Work by American investigators and foreign students, however, has revived and improved the older methods so that today such procedures are finding recommendation as being particularly suited to the needs of the farmer and small processor.

Employing aqueous solutions of preservative salts, such as chromated zinc chloride, zinc chloride, copper sulfate and others, which are distributed within the wood by means of normal physiological activities, the processes are applicable both to freshly felled timber and standing trees. Many kinds of hardwood and soft wood saplings or small trees may be treated by these simple methods to yield better fence posts, bean poles, garden stakes and the like. Such treated products will last many years longer than untreated ones.

Freshly cut saplings may be treated by "stepping" or immersing their cut ends in a solution of the requisite preserving chemical. Leaving a few upper branches on the trees facilitates and speeds the treating process. For larger trees or trunk sections, the capping method may be employed. By this method the butt end of a felled tree or one end of a pole is encased in a cap container which holds the solution in direct contact with the wood until the chemical is absorbed. A combination cap and container can be made from a length of automobile inner tube. Water-tight, collar-like containers of rubberized fabric or coated crepe paper may also be used, and at least one

rubber cap for treating the ends of wooden poles or the like with preservatives has been patented. Various other simple devices are also used.

Collar and banding methods are employed to treat standing trees to preserve them from decay and insects when used after the trees are cut down and sectioned. These methods require more materials and labor and are more complicated than either stepping or capping. These various sap-stream methods may be used with trees up to about eight inches in diameter, but there remains a need for a more practical method for treating large trees.

The growing use of these and other nonpressure methods has opened a new market for special wood-preservative chemicals. Literally scores of chemicals and chemical mixtures have been used in the past and it is said that even today there are almost as many chemical preservatives for wood as there are wood species. Actually, however, comparatively few materials have been found to have real value as wood preservatives because they fail to meet one or more of the basic requirements for such products.

The properties of a good wood preservative are well established. Stated briefly, such a preservative should be: (a) destructive or repellent to injurious fungi and insects over a reasonably long time; (b) harmless to man and other warm-blooded animals; (c) easily applied for ready absorption and even distribution; (d) reasonably cheap and readily available; (e) non-injurious to treated wood; and (f) non-corrosive to metal. For special uses additional requirements may include cleanliness, paintability, freedom from odor or color, fire resistance, moisture repellence, freedom from swelling, or various combinations of these properties.

As a result of tests and on the basis of long-time usage, specifications for certain wood preserving chemicals have been developed by Government agencies as well as by industrial groups, such as the American Wood-Preservers' Association.

Materials of established protective value are available on the market under standard chemical or proprietary names. Many new products are being developed as well, a fact clearly evident in the number of patents being granted for wood preservative products. As might be expected, some of these preservatives are more effective than others. All of them possess certain disadvantages which limit their use, as well as certain specific characteristics that make them especially suitable for specific purposes.

With the possible exception of

certain chemical mixtures, wood preservatives may be divided into three general classes: (a) the toxic oils, like creosote, which are relatively insoluble in water and of low volatility; (b) the inorganic salts and similar materials that are used in aqueous solution; and (c) highly toxic chemicals that are dissolved in a solvent or solvent mixture other than water.

The common commercial preservative oils include the creosotes of various derivations, solutions of creosote, and anthracene oils or carboliniums. As a group, they are especially suited for the treatment of timber to be used in contact with the ground, but may also be used for protection above ground.

Coal-tar creosote is the standard wood preservative in this country. A black or brownish oil obtained in the distilling of coal tar, it has been used as a wood preservative for more than a century. No other chemical has had such extensive use or such long service records, or has been proved to be so effective for timber to be used in or above the ground. Although for general outdoor service in structural timber there is, as yet, no better preservative than coal-tar creosote, it has certain properties that are not advantageous for some uses. Freshly creosoted timber will ignite easily and burn readily, but after seasoning, the treated wood is comparable to untreated timber in inflammability.

Most coal-tar creosote finds its way into commercial plants for the pressure treatment of wood. Where such treatment is not feasible, non-pressure methods are employed. Of these, the hot-and-cold bath, or open tank, treatment is the best, but other methods are also employed.

To reduce treatment costs, it has long been common practice to dilute coal creosote with petroleum oils in various proportions. The more commonly used mixtures contain from 45 to 55 per cent of petroleum, such combinations being extensively used. Surface treatment by immersion in a solution prepared by diluting one part of coal-tar creosote with three parts of kerosene has been recommended for the protection of wood for rustic construction against boring insects.

Creosotes derived from sources other than coal tar are also valuable for the preservative treatment of the wood. Though not so toxic or generally effective as coal-tar creosotes, water-gas creosote is known to be a good preservative. A similar statement can be made with regard to wood-tar creosotes. When of a good quality and properly applied, they are highly effective.

Various tars find use in the

preservation of wood. Coal tars, while seldom used alone, are often mixed with coal-tar creosote; such combinations being extensively used for treating railroad ties. Water-gas tar finds less extensive use but has given good results in certain cases, such as the treatment of fence posts. Service tests show that water-gas tar is a very good preservative when properly applied and that it is well worth considering as a substitute for coal-tar creosote for land use. Practically all the water-gas tars can be mixed with coal-tar creosote.

Anthracene oils or carboliniums are coal-tar distillates of higher boiling point and specific gravity than coal-tar creosote, but their general properties and effectiveness as wood preservatives are similar to those of the creosotes. Usually sold under various trade names, these oils are used chiefly for non-pressure processes.

The second major group of preservative chemicals are the water-soluble salts. These include zinc chloride, copper sulfate, certain fluorides, and mercuric chloride. Certain proprietary products, generally mixtures, also belong to this class. Aside from their value as preservatives, they are important because they yield clean timbers for use above ground. Wood treated with these salts can be finished or painted as desired. With water-borne preservatives, seasoning is essential after treatment for structural timbers to prevent shrinkage of the wood after placement in a building. Water-soluble preservatives are subject to leaching and hence do not perform as satisfactorily as creosote under wet conditions. However, they are capable of providing considerable protection, especially in dry climates.

Although it is being displaced to a certain extent by chromated zinc chloride and certain proprietary preservatives, zinc chloride still occupies an important place among the water-soluble treating salts. Its principle advantages are relative cheapness, uniformity, availability, cleanliness, lack of odor, ease of shipment and freedom from fire hazard. When injected into wood in the usual quantity, zinc chloride slightly reduces inflammability. Wood treated with zinc chloride and properly dried after treatment, finds frequent use in building construction, being especially valuable for roof planking on buildings where high humidity conditions hasten decay.

The chief disadvantage of zinc chloride is its tendency to leach out of wood that is in contact with water or damp soil. Nonetheless, it has been found satisfactory for treating posts, poles

and the like by the sap stream and other non-pressure methods.

Possessing similar properties but showing less tendency to leaching, chromated zinc chloride is finding extensive use in place of zinc chloride. Indicative of this trend is the recent recommendation that chromated zinc chloride be the first choice, over zinc chloride or copper sulfate, for the sap-stream treatment of posts and poles for farm use. Consisting of approximately 18 per cent of sodium dichromate and 82 per cent of zinc chromate, it finds uses similar to those of zinc chloride.

Although copper sulfate (bluestone, blue vitriol) has long been known as an effective decay retardant, it has found comparatively little use by itself in commercial processes because it attacks the iron and steel of the treating equipment. Because of this action, even for small scale use the copper sulfate solutions must be stored in glass, ceramic or wooden containers. While found satisfactory for treating posts and poles, it has a tendency to stain the wood and to cause corrosion of ungalvanized nails, wire and staples.

Sodium fluoride is also an important ingredient of proprietary and patented wood preserving mixtures. Not widely used in this country except in treating factory roof timbers, sodium fluoride is rather widely employed in Europe for treating railway ties and mine timbers. Other fluorine compounds may be useful as wood preservatives, but European studies indicate that it is inadvisable to use wood impregnated with fluorine compounds in hotbeds or greenhouses because the salts leach out of the wood.

Mercuric chloride or corrosive sublimate, though one of the oldest of wood-preserving chemicals, finds but little use in this country. Although an excellent preservative, its relatively high price, poisonous character and corrosiveness to metals have militated against its wider application. The salt was found unsatisfactory when applied by sap-stream methods. Arsenic in various forms, used alone or in combination with other chemicals, has given promising results. Their highly poisonous character, however, would seem to limit their usefulness, especially for the small processor.

In addition to the above compounds, there are also a number of proprietary mixtures of various wood preserving chemicals. Products like Celcure and Tanalith have been recommended in Federal Specifications, while other waterborne preservatives that

clude those known as Chemonite, greensalt and Osmose preservatives.

Comparative newcomers are the highly toxic organic chemicals which are applied as solutions in suitable solvents. As a group, these preservatives have been developed to meet the need for treatments that will not swell the wood nor require long drying and which will leave the wood clean, paintable and odorless. Of the several materials developed to meet this need, pentachlorophenol is undoubtedly the most important. Dissolved in petroleum solvents, 5 per cent solutions of pentachlorophenol have found increasing use in the treatment of timber, lumber, posts, poles and other structural parts. They were also widely used by the armed forces during the war.

In this concentration, the toxicity to wood degrading organisms displayed by pentachlorophenol solution appears to be equal to or greater than that shown by the coal-tar creosotes now in use. Treatment costs also appear to be on a favorable competitive basis with coal-tar creosote. Although commercial production of pentachlorophenol was begun only about ten years ago, show considerable promise in the chemical solutions have already been subjected to many investigations which more than indicate its effectiveness as a wood preservative. Of course only the time-taking service tests will provide the final evaluation. The solutions may be applied by both pressure and non-pressure methods. Government bulletins as well as manufacturers' publications have provided details on how wood may be treated with 5 per cent pentachlorophenol solutions by the cold-soaking method. Ready-to-use formulations for cold-baths, brush and spray treatments are available commercially.

Similar solutions of other polychlorinated phenols such as tetrachlorophenol, are also being studied and applied because of their cheapness and high toxicity. Beta naphthol and alphanitronaphthalene are also being employed to some extent. Interest has also been focused on various metallic naphthenates, such as copper naphthenate, and zinc naphthenate, which have shown considerable promise as wood preservatives. The search for newer and better preservatives is constantly being made and the means of applying them improved and simplified.

Brome Must Have Good Management

Condensed from Successful Farming

Maurice L. Peterson

Iowa State College

BROMEGRASS will play a leading part in carefullly planned cropping systems. Its value cannot be measured in terms of hay or pasture alone, but also must be measured in its ability to slow down erosion.

There are disappointments ahead, however, for some of the users of bromegrass unless better management practices are followed. Few realize the heavy nitrogen requirement of bromegrass, even though the problem has been recognized for many years. As long ago as 1902, John Byers, now a retired farmer in Aurora, Nebraska, seeded a 3½-acre field of bromegrass in Hamilton County. This field showed evidences of lowering production only two years later. The field was disced and heavily manured in 1904 and responded by producing 2,100 pounds of seed in 1905. Now, some 40 years later, the problem of usable nitrogen for bromegrass still stands at the head of the list of management problems with this crop.

The need not only for seeding but also for maintaining legumes in bromegrass is generally known. Alfalfa is queen of the legumes for this purpose, but there are problems in maintaining it with the bromegrass. A widely used mixture in Iowa is 8 pounds of alfalfa, 3 of red clover, and 8 to 10 of bromegrass per acre. It is thought that the red clover tends to keep the bromegrass in check the first and second years, supplies nitrogen through its decaying roots the latter part of the second year and through part of the third year following seeding.

These seedings are usually made in early spring with an oats nurse crop which is either harvested for grain or removed by grazing. In areas where heat and drouth are likely to injure seedings following grain harvest, the grazing method is superior for getting a good stand started, and the oats provides excellent spring pasture. The need of bromegrass for fertilizer will be satisfied on any soil which will produce good stands and growth of the legumes with which it is sown.

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Late-August seedings of alfalfa-brome following a small-grain crop are generally preferred in regions of less rain, and one of the secrets for getting good stands is early preparation of the seedbed by plowing or discing the stubble.

The importance of keeping alfalfa hitched up with bromegrass was shown in a yield study with 10 varieties of bromegrass sown in August, 1944, on the College Pasture Improvement Farm at Albia, Iowa. Each variety was seeded without any legume at 15 pounds per acre and also with alfalfa using a mixture of 12 pounds of bromegrass and 8 pounds of alfalfa per acre. The average yield of all varieties the following year was 2.72 tons of hay per acre seeded alone and 3.39 tons, or 25 per cent more, seeded with alfalfa.

The production obtained in June of 1946 from this same experiment was much more striking. The southern varieties, Lincoln, Fischer, and Aschenbach—when grown with alfalfa—produced 2.79 tons per acre, and this was just double the yield of these varieties grown without a legume. At the same time, three northern varieties, Iowa Commercial, Canadian, and Parkland, produced a scanty ¾ ton when seeded alone and 2.59 tons, or 3½ times as much, when grown with alfalfa. There also was 20 per cent more alfalfa present in the plots seeded to the northern varieties.

The shortage of bromegrass seed of the southern type for seeding next spring is going to tempt many farmers to hold over the old stand another year, even though the legumes may be gone, rather than use Canadian or other northern bromegrass. This may be justifiable in the western and southern part of the bromegrass belt where drouth or long, hot summers rule out northern bromegrass. However, our yield data show a 1.19-ton yield advantage of a northern bromegrass-alfalfa mixture over the southern types without legumes. Therefore, where nitrogen is likely to be the factor limiting production, a new seeding of northern bromegrass with ample legume growth is greatly to be preferred to a sodbound stand of southern types.

It is perhaps unfortunate that in much of the early publicity given bromegrass great emphasis was placed on the fact that it was the ideal grass for seedings which were to be left down over a period of years. Stories were written about stands 40 to 50 years old.

There are many acres which *do* need to be returned to permanent grass vegetation, and bromegrass certainly excels for this purpose. There are many

more acres which are suitable to cropping but must frequently have grasses and legumes in the rotation to control erosion and maintain fertility. On these farms, it is just as poor management to maintain bromegrass indefinitely on one field as to permit the remainder of the farm to suffer from repeated cropping to corn.

Sodbound bromegrass stands which have been plowed for corn have often failed to give the hoped-for increase in yields and in many cases actually have produced 10 to 15 bushels less than land not previously in grass. Dr. L. C. Newell, forage-crops specialist with the U. S. Department of Agriculture at the Nebraska Experiment Station pointed out that plowing a sodbound stand of bromegrass may be equivalent to plowing under around 2 tons of straw per acre. Whether it is bromegrass roots or straw, the available nitrogen is tied up temporarily until rotting is well along. Consequently, the corn crop may suffer from lack of nitrogen at a critical time. Newell suggests two remedies: first, plow as long in advance of corn planting as possible or, second, apply nitrogen fertilizer to the corn crop.

One of the advantages of bromegrass is its many different uses. It may be pastured, harvested for hay, seed, grass silage, or various combinations of these. New stands often may be used for hay the first year. Sometimes the fact that there are more legumes than brome in new seedings may make grazing questionable in the first year where bloat is a hazard. Bromegrass generally thickens sufficiently by the second year to provide an ideal pasture combination. It also is in this second year that top seed yields are obtained. It may suffer from lack of nitrogen by the third year.

M. W. Martin and Son, of Hancock, Iowa, are developing a bromegrass management program aimed toward seed production. The bromegrass is seeded with alfalfa and maintained for three crop years. The first year's stand is to be harvested for hay because this will aid in eliminating stray plants of downy brome and other undesirable weeds. Seed is combined the second year, cutting only the heads above the bromegrass leaves and the alfalfa. The hay which remains is then cut, cured, chopped with a field chopper, and stored in the barn. They find this a good way to get maximum use from the hay which normally would be of poor quality because of its excessive coarseness.

D. L. Gross, extension agronomist at the University of Nebraska College of Agriculture, interviewed and corresponded

with a number of farmers in that state to find out their experiences with plowing bromegrass sods and also with the production of crops which follow. Mr. Gross stated that a few rather definite conclusions might be reached, recognizing that these may eventually need to be changed in the light of further research and experiences. Some of these conclusions follow:

(1) Bromegrass sod is as tough to plow as native sod.

(2) Plowing at least four inches deep—or deep enough to expose the root stocks—is necessary if the bromegrass is to be killed easily.

(3) Plowing when bromegrass is dormant, as in late fall or midsummer, is most likely to kill the bromegrass, although little trouble has been experienced by farmers when plowing was done in early spring.

(4) Bromegrass is a heavy user of nitrogen, and land which has been in bromegrass alone for several years cannot be expected to give good yields of grain crops after breaking.

(5) Maximum grain yields can be expected following bromegrass-alfalfa if the alfalfa was in a strong growing condition when plowed and if soil moisture is not a limiting factor.

The increase in the use of bromegrass may be credited to its value as a top forage producer and as a soil-conserving crop. However, we are concerned about conservation, because conservation is essential for production from the long-time point of view. Bromegrass can be a vital link in gearing a conservation program with abundant production. But, if we continue to abuse the management of bromegrass with the result that production drops, conservation will likewise suffer.

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Dairy Cattle Feeding and Management—3rd Edition—By H. O. Henderson, Prof. of Dairy Husbandry, W. Va. Univ., Carl W. Larson and Fred S. Putney. John Wiley & Sons, Inc. $4.50.

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Farm Management Manual—V. B. Hart, S. W. Warren, Ivan R. Bierly—N. Y. State College of Agri. Comstock Publishing Co. $1.00.

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INDEX

Beef Cattle

Salt Is Must for Stock Raising....July, 1946
What Constitutes Nicking?..Aug.-Sept., 1946
Livestock Thrives on Moldy Corn, Aug.-Sept., 1946
What It Takes to Succeed as a Breeder, Oct., 1946
Livestock Assembly Line .....Dec., 1946
Beef from Less Corn .....Dec., 1946
Production or Reproduction .....Dec., 1946
Shipping Fever .....Jan., 1947
Livestock Production .....Feb., 1947
Heredity and Prepotency .....Feb., 1947
Beef Cattle .....April, 1947
When is a Breed? .....May, 1947
How Much Will He Weigh? .....June, 1947
Proper Livestock Feeding .....June, 1947
Problems of Livestock Producers...July, 1947
Osage Cattle Kingdom .....Aug.-Sept., 1947

Conservation

Earthworms Fight Erosion...Aug.-Sept., 1946
We Took the Job Out to the Land..Dec., 1946
Introducing InLac .....Jan., 1947
Nature's Mighty Plowman .....Jan., 1947
New Outlets for Farm Products..Feb., 1947
St. Joseph Helps the Farmer .....Feb., 1947
Land Use and Conservation.....May, 1947
Fish Farming Pays Dividends.....May, 1947
Blue Lupine in the Southeast.....June, 1947
1000 Acres Back to Work.....July, 1947
Greece Looks Ahead .....July, 1947

Crops

The New Sweetclovers .....Jan., 1947
Mammoth or Medium Red Clover..Jan., 1947
New Uses for Cotton .....Jan., 1947
Growing Legumes on Acid Soil....Jan., 1947
Bur Clover Comes Into Its Own....Feb., 1947
Rice Growers Dry Their Boots ....Feb., 1947
He Grows $1,000 on Each Acre....Feb., 1947
Calves Solve a Problem .....Mar., 1947
Rose Farmers .....Mar., 1947
Crops .....April, 1947
Successful Seeding Tricks .....April, 1947
A Better Sudan .....April, 1947
Australian Subterranean Clover....April, 1947
Rich Fog in the Hollows.....May, 1947
200 Bushels of Ear Corn Per Acre..May, 1947
Rust: Shifty, Costly Wheat Enemy..June, 1947
Major Elements in Plant Nutrition June, 1947
Experience with Ladino Clover ....June, 1947
New Clovers and Alfalfas ..Aug.-Sept., 1947
Hot Hay .....Aug.-Sept., 1947

Dairy Cattle

Modern Trends with Dairy Herds..July, 1946
More Milk Dollars from Cross-Breds, Aug.-Sept., 1946
Dry Milk Has a Future.....Aug.-Sept., 1946
Predicting Production in Heifers, Aug.-Sept., 1946
Spring Freshening Cows—More Milk, Aug.-Sept., 1946
Preparing Calf for Show Ring..Aug.-Sept., 1946
Flavor in Milk .....Oct., 1946
Out on First Record .....Oct., 1946
Learning More About Cows .....Dec., 1946
Cooling Milk for Keeping Quality..Dec., 1946
What's Skimmilk Worth .....Dec., 1946
Dairy Calves Need Good Feed and Care, Jan., 1947
Reducing Cost of Milk Production..Jan., 1947
What It Takes to Feed a Cow.....Jan., 1947
Practical Feeding for Milk Production, Feb., 1947
Calves Solve a Problem .....Mar., 1947
Selecting Your Herd Sire .....Mar., 1947
"Mail Order" Breeding .....April, 1947
Why Stoop to Milk? .....May, 1947
World's Cheapest Hired Hand.....May, 1947
Ensilage Feeding Without Work...May, 1947
The Romance of the Gut .....June, 1947
Radiant Heat in the Dairy Barn...June, 1947
An Old Fiber with a Future.....July, 1947
No Fork on This Farm .....July, 1947
One Man Silo Filling .....July, 1947
Roughage for Dairy Cattle ..Aug.-Sept., 1947

Farm Machinery

Tending Lights and Starter.....July, 1946
Post War Machinery for the Fruit Grower, Dec., 1946
Farm-Size Crop Driers .....Jan., 1947
Air-Minded Farmers .....Jan., 1947
New Weapons to Stop Rust.....April, 1947
Operation of the Barn Hay-Drier..June, 1947
A Hired Man or More Machinery?.June, 1947
Cooling Milk to Warm the Profits, Aug.-Sept., 1947
One Failure in 8 Years .....Aug.-Sept., 1947

Fruit

Blueberry Growing .....June, 1946
The Blackberry—A Neglected Fruit July, 1946
The Trees Can Tell You.....July, 1946
Creeping Trees of Siberia.....July, 1946
Ask the Trees .....Aug.-Sept., 1946
The Romance of the Fig.....Aug.-Sept., 1946
Soil Management—Its Influence on Apple Tree Roots .....Oct., 1946
Zinc Coated Nails Check "Little Leaf," Oct., 1946
The Fruit Garden .....Jan., 1947
New Life for an Old Vine .....Feb., 1947
Fighting Frost with Ice .....Mar., 1947
Sell Your Black Walnuts .....May, 1947

Fertilizers

Old and New Fertilizers .....June, 1946
Production of Mulch Material .....June, 1946
B Vitamins from Cow Manure ....June, 1946
Phosphates in Their Working Clothes, Aug.-Sept., 1946
The Farmer's Wood Bank .....Oct., 1946
Fertilizing for Yield and Soil Improvement, Dec., 1946
Fertility in a Hurry .....Dec., 1946
Fertilizer Nitrogen from Various Sources, Mar., 1947
There's Money in Manure.....May, 1947
Feed the Crops for High Yield ....April, 1947
The Story of Fertilizer .....July, 1947
Calcium vs. Magnesia in Agricultural Lime July, 1947
The Fertilizer Rate Problem ..Aug.-Sept., 1947

INDEX

Hay

Cut Hay Right and Cut Feed Costs . . May, 1947
What's Wrong with Hay . . . . . July, 1947

Hogs

Alfalfa Decreases Pig Death Losses Jan., 1947
Breeding Season Management . . . . Jan., 1947
Increasing Pork by Decreasing Loss Feb., 1947
Swine Nutrition . . . . . Mar., 1947
Plan Ahead for a Profitable Pig Crop, Mar., 1947
A Search for Better Hogs . . . . . April, 1947
Feed for the Pregnant Sow . . . . . April, 1947
Are Hybrid Hogs Coming? . . . . . April, 1947
Easy Way to Make Pork . . . . . June, 1947
Pointers on Pigs . . . . . July, 1947
Control of Necro . . . . . July, 1947
Multiple Farrowing . . . . . Aug.-Sept., 1947
Baby Pig Disease . . . . . Aug.-Sept., 1947

Horses

The Pinto Horse . . . . . Dec., 1946
The Arab Horse . . . . . May, 1947

Insecticides

DDT Dust Controls Chinch Bugs . . Jan., 1947
Fermate to Control Blue Mold . . . . Jan., 1947
No More Bugs to Bother Them . . . . Feb., 1947
New Methods to Apply Concentrated Spray, April, 1947

Insects

New Life for Old Pastures . . . . . Feb., 1947
Hormones Reduce Insect Damage . . June, 1947
Now Pest Damage Can Be Predicted July, 1947
Destruction in the Dark . . . . Aug.-Sept., 1947

Pastures

Pasture Improvement . . . . . May, 1947
Managed Pastures . . . . . June, 1947
Kentucky's New "Wonder Grass" . . June, 1947
"Airplane Poison" . . . . . July, 1947
Pasture Silage — Quality Feed . . . . July, 1947
Rotation Grazing . . . . . Aug.-Sept., 1947

Poultry

Keep Cost Low—Efficiency High . . Jan., 1947
Sulfamerazine Controls Coccidiosis Jan., 1947
Handling Poultry Manure . . . . . Jan., 1947
Better Hatching Eggs . . . . . Feb., 1947
Producing More Profitable Poults . . Feb., 1947
Dry Land Duck Farming . . . . . Feb., 1947
Radiant Heat for Brooding . . . . . Mar., 1947
Pullets Pay Better . . . . . Mar., 1947
Add to Profits with Capons . . . . . Mar., 1947
Geese on the March . . . . . April, 1947
Large Laying Pens Save Labor . . . . April, 1947
Diagnosing Newcastle Disease . . . May, 1947
Is Range Rearing on the Way Out? May, 1947
New Ration for Chickens on Range May, 1947
Lime Treatment of Floor Litter . . . . June, 1947
Hens Go to Summer Camp . . . . . June, 1947
Limited Trapnesting . . . . . June, 1947
Don't Cull Those Broody Hens . . . . June, 1947
Heat — The Enemy of Egg Quality July, 1947
Artificial Control of Egg Production July, 1947
What "Hen Pecked" Means . . . . . July, 1947
One Man Egg Factory . . . . . Aug.-Sept., 1947
Bran Replaces Litter with Radiant Heat, Aug.-Sept., 1947

Sheep

Feeding Ewes to Prevent Pregnancy Disease, Mar., 19
The Greatest Honor in Shepherd Craft, April, 19
Minnesota 100 — A New Sheep . . . . May, 19
Lamb Production Project . . . . . June, 19
And Now It's Sheep Fur . . . . . July, 19

Soils

Ammonia Gas is Soil Fertilizer . . . . . Jan., 19
Soil Structure is Key to Yield . . . . . Jan., 19
Solving Secrets of the Soil . . . . . Mar., 19
Slow Fires in the Soil . . . . . April, 19
Those Three Mineral Musketeers . . April, 19
Healthy Soils for Health . . . . . May, 19
The Soil — A Dependable Banker . . June, 19
The Use of D.D. for Soil Fumigation July, 19
Cover Crops Help Save Soil . Aug.-Sept., 19

Forestry

This Farm Wood Earns Cash . . . . . Jan., 19
Harvesting the Timber Crop . . . . . Feb., 19
Direct Seeding Tool . . . . . Mar., 19
Farm Wood Lots . . . . . May, 19
Making New Chestnut Trees . . . . . July, 19

Weeds

Cashing in on Weeds . . . . . Mar., 19
Kochia—The Weed That's Feed . . . Mar., 19
Lovegrass in the Windy West . . . . April, 19
Cultivating with Oil . . . . . April, 19
Warrin' on Weeds . . . . . April, 19
New Weapons in Fighting Weeds . . June, 19
New Bindweed Control Method, Aug.-Sept., 19

Vegetables

Film Wrapped Corn Stays Fresh . . . Mar., 19
Seed Growing—New American Industry, Mar., 19
Farming in a Kentucky Cave . . . . . April, 19

Miscellaneous

Science Versus Dust and Mud . . . . May, 19
Farm Meats for Storage Lockers . . . May, 19
Rabbits for Meat, Fur and Wool . . . May, 19
Stabilizing Britain's Agriculture . . . May, 19
Replacement of Greek Livestock . . . May, 19
Sore Hocks in Domestic Rabbits . . . June, 19
Zoysia . . . . . June, 19
Star Farmer . . . . . June, 19
How Large Should a Farm Be? . . . . July, 19
What is Balanced Farming? . . . . . July, 19
Scottish Agriculture . . . . . July, 19
Community Improvement Contests . July, 19
Delivering Bulk Feed to the Farm . . . July, 19
Mow Your Lawn Correctly . . . . . July, 19
4,000 Quarts Every Minute . Aug.-Sept., 19
Three Money-Making Ideas . Aug.-Sept., 19
Iceless Refrigerator Cars . . . Aug.-Sept., 19
Farming in the Land of the Rising Sun, Aug.-Sept., 19
How Our Land is Used . . . . . Aug.-Sept., 19
The Miracle of Our Food Production, Aug.-Sept., 19
Nematodes and Nematocides . Aug.-Sept., 19
Purebred Salesmanship . . . . . Aug.-Sept., 19
What About New Buildings . . Aug.-Sept., 19

AMONG THE NEW BOOKS

THE GARDENERS BUG BOOK—Cynthia Westcott. Edited by F. F. Rockwell. The American Garden Guild, Inc. 1946. $4.95. 589 pp.

Cynthia Westcott has compiled a practical manual on the control of garden pests which is the result of many years of practice and much careful study. A brief history is given on each of 1000 insect pests, a full description of them in every stage of their life cycle, the plants attacked, the type of injury done, and control measures. The text is simply written and directions specific. A large number of excellent illustrations aid in the identification of pests. Spraying, dusting, fumigation, the kinds of garden chemicals, and how and when to use them, are discussed in detail. The book is so planned and indexed that it is very easy to find the desired information.

LAND FOR THE FAMILY—A Guide to Country Living. A. F. Gustafson, E. V. Hardenburg, E. Y. Smith, of the New York State College of Agriculture, and Jeanette B. McCay, formerly of the New York State College of Home Economics, at Cornell University. Comstock Publishing Co., Inc. 1947. 487 pp. $4.00.

This book is designed primarily for those who are planning a home in the country which they hope to make self sufficient, but it will also be of value to those who are experienced in country living. Practically every phase of rural life is considered. Selecting and buying a home; managing the soil; choosing the crops to grow; flower, vegetable, and fruit growing; production of livestock and poultry; butchering; and managing the woodlot; are discussed in detail with an analysis of the cost involved. A bibliography is given on each subject. An excellent section on home economics is included which discusses the needed equipment for the country kitchen, and gives directions and charts for canning, freezing, and drying foods. The book is well planned, its information definite, its directions explicit.

THE LAND AND WILD LIFE—Edward H. Graham. Oxford University Press. 1947. 210 pp. $3.50.

This book is a plea for the preservation of our country's wild life through the conservation of land. Dr. Graham reveals the appalling loss and, in far too many cases, the extinction of animals and birds native to this country through destructive land practices. The author, writing from his experience as Chief of the Biology Division of the Soil Conservation Service, makes the point that all land, if properly managed, will be productive, if not of agricultural products, then of fur bearing animals, birds and fish, which have an important place in our economy. Swamps, gullies, stream banks, open ranges, and woodlots can all be used to advantage. Every land owner would do well to consider Dr. Graham's ideas.

The rapid Progress true Science now makes, occasions my regretting sometimes that I was born so soon. It is impossible to imagine the Height to which may be carried, in a thousand years, the Power of Man over Matter. We may perhaps learn to deprive large masses of their Gravity, and give them absolute Levity, for the sake of easy Transport. Agriculture may diminish its Labour and double its Produce; all Diseases may by sure means be prevented or cured, not excepting that of Old Age, and our Lives lengthened at pleasure even beyond the antedulevian Standard. O that Moral Science were in as fair way of Improvement, that Men would cease to be Wolves to one another, and that human Beings would at length learn what they now improperly call Humanity!

Letter from Franklin to Joseph Priestly
Passy, France, 1780